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New facts concerning our early railroad history are constantly coming to the fore. A few years ago we published a correction relative to the date of the trial of the locomotive "West Point" on the South Carolina R. R. One of our members recently visited the Jervis Library at Rome, N. Y. From the letters that were found we can add some little data relative to the early engines for the Delaware & Hudson including the correct name of the Stephenson locomotive. The notes of Mr. Kessler on this subject are of great interest and value.

We welcome again to our columns an interesting contribution from Mr. Warner on the Anthracite-burning Locomotives. This paper was originally read before our New York Chapter some time ago but the author has carefully revised it for our publication. Although these locomotives saw service in only a limited section of this country, by and large they present an interesting and important step in the development of our modern engines.

In the early days Richmond, Virginia had its pioneer roads. They played an active part in defending the Confederacy and then came the consolidation period and finally the growth of that magnificent property

The Bronze Tablet presented to this Society by the Railway Express Agency.

—the Norfolk & Western R. R. Of interest is the fact that the Roanoke Machine Works, now the Roanoke Shops of the N. & W. still continue to build some of the heaviest locomotives used on this road. Mr. Nichols has given us an interesting paper on this southern road. To Messrs. Moody, Green and Miller, we wish to extend our appreciation for their efforts in contributing papers of genuine interest. We hope that the reproduction of the handsome bronze plaque, gift of the Railway Express Agency will induce our members to see this handsome memorial and our exhibit in the Baker Library as well.

As announced in Bulletin #51, your Society will again have an exhibit at the New York Fair through the courtesy of the President's Committee of the Association of American Railroads. A day spent in the Railroad Building at the New York Fair will be well rewarded—certainly there will be plenty to interest any of us who love the steam locomotive and the railroad.

Cover Design

Down in the New Jersey hills there winds a little road—the New York, Susquehanna & Western R. R. Single track most of the way, passing sidings at stations, some grades and plenty of curves. Mr. J. Henderson Barr has reproduced for our cover design a typical station scene along this road, back in the first decade of this century, when commuters used trains instead of 'busses or their own cars and the 4-4-0 type engine was common on those trains instead of a rarity today.

Biography of a Centenarian

By Louise Driscoll

On an October day in 1837 a child was born in an old stone house in the little village of Piermont on the Hudson River. He was never to live far from this river which his ancestors had known for two hundred years. His mother was Eliza Burgess Shaw, a descendant of Johannes Ver Veelen who came to this country from Holland in 1632 and was a patentee of Harlem. Her father was Jeremiah Shaw, a "whitesmith" who designed and made much of the ornamental ironwork with which so many of the better houses of old New York were decked. His father was Isaac Blauvelt Driscoll, the grandson of an Irishman who came to Connecticut from France during the Revolution. Isaac married Catherine or "Caty" Blauvelt, so John Leonard Driscoll, a typical American, has mixed blood in his veins, English, Irish and Dutch, but predominantly Dutch. He spent his early years in a Dutch environment and he is today the oldest member of the Association of Blauvelt Descendants.

He often says in this his great age, that this is not the world into which he was born. The history of transportation has taken place before his eyes as a panorama. He remembers when every village along the river had its "market sloop," when all the carrying was done by boat or stagecoach. He has seen the river white with sails and watched the early steamboats. He was born into a world where family life was centered about a great fireplace. He has often told his children that when he was born he was well wrapped and put into a hooded cradle that was set at one end of such a fireplace while a low fire burned at the other with plenty of room between. He was born into a world of candles and was happy when he brought to his mother-in-law the first kerosene lamp she had ever seen. When he was a little boy the first telegraph wires were strung along the river and a workman gave both to him and his brother one of the glass insulators which they used as candlestick holders. One of his earliest tasks was helping his mother make candles, holding the wick while she poured wax or tallow into the mould.

The family soon moved to Blauveltsville where he lived among the relatives he remembers so pleasantly. Later, in 1844, they went to New York City where he used to carry water for his mother from the pump in the street that was the only supply in those days. He went swimming in the river along what is now the Twentieth and Thirtieth Streets which was then a pleasant wooded bank. His school was a little below Thirteenth Street and near a vacant space known as the "tile lot" where certain supplies were kept by the city. It was evidently safe to leave supplies in a vacant lot in those days, and the boys used to amuse themselves by crawling through the larger pipes. There was no city above Fourteenth Street.

Before her marriage his mother, who was an artist, had been apprenticed, after the manner of the day, to John Browere who made the masks that are getting attention now after being so long neglected. She had helped make some of these and knew the process which she never told

since Browere wished it to remain a secret. Before Browere died, of the plague, he asked her to finish the masks he left unfinished, which she did. Mr. Driscoll remembers being taken when he was five years old, to call on Browere's widow who lived at One Hundred Bowery.

The family moved to Newark where his home was a small house that he remembers pleasantly. He had a brother and two sisters now. There was a horse and buggy, a cow and chickens, a garden where potatoes and other vegetables were raised and he used to swim in the canal, the waters being then unpolluted. It was here that his father died, very suddenly, only thirty-six years old. (Mr. Driscoll has reached the age of one hundred and two years and six months and his brother and one sister lived well past ninety.) It was then, at the age of fourteen, he went to work.

He was apprenticed first to one Poyner, who taught him to make shingles. By hand, each shingle had to be made the same width at each end. His second job was a short one. His master was a man named Engles and the work was making carriage lamps. When the time came for the apprentices to be paid Engles remarked that it "was bad for boys to have so much money" and gave only half of what had been earned. So two of the boys, of whom Mr. Driscoll was one, left, feeling their bargain was invalidated.

His third employer was Juggen, a carpenter and builder and his work was at first, assembling rules. He became a good craftsman and then went with a relative, the firm of Ver Veelen and Wolf, who were cabinet makers. He learned the old beautiful way of assembling furniture and it was to this, as a hobby, he returned after he retired. He has often said that the eight years he worked in wood were most valuable to him in later experience. Before the days of technical schools he familiarized himself with the principles of mechanics and engineering.

When he first saw his future wife she was in an apple tree. She was very small and blonde and climbed like a child. Her name was Deborah Louisa Dezendorf. Her father was Bernard Dezandorf whose father had come from Frankfort-am-Main during the Revolution and her mother was Elizabeth Valentine whose ancestors had been on Long Island farms for several generations. Grandfather and father had owned a farm in what is now Brooklyn, part of which is now Clinton Avenue. The father sold this farm and bought a smaller one in Rockland County. Mr. Driscoll was now employed by the Hudson River Railroad Company. Railroads had always been his first interest. He had once built a train that he kept under his bed and he made a stationary engine that was stolen, he never knew by whom.

At first he was fireman on a wood-burning engine, then he became an engineer. During the Draft troubles at the time of the Civil War he had a curious experience when once, at night, he suddenly stopped his engine. He has always said he did not know why, but on going ahead with a lantern an obstruction was found on the track. This episode became one of his children's favorite stories.

After his father's death his mother had returned to Nyack where she taught the art classes in the Tappan Zee Institute, one of the earliest

institutions for the education of girls. She later came with her son and his wife to Sylvan Lake where they lived for two years, when he was asked to go to Poughkeepsie as Master Mechanic for the Poughkeepsie and Eastern Railroad Company, and here he remained for eleven years. In 1882, he accepted a position with the newly planned Catskill Mountain Railway which was to be built by the Hudson River Day Line Steamboat Company and the proprietors of the Catskill Mountain House. He superintended the building of this road, a narrow gauge; and later, the branch that ran to the village of Cairo in Greene County.

The Otis Elevating Railway was built in 1892, an inclined plane going up the side of the mountain. Mr. Driscoll made changes later that permitted baggage cars to be switched from the Mountain Railway to the Otis and be carried up the incline. This experiment was a complete success and remained in operation until the roads were abandoned as the automobiles encroached upon and ruined the very considerable business that had been carried on so many years.

A short road had been built from the top of the Otis to the village of Tannersville. This was run with so much informality that many persons never realized the difficulties involved. When Mr. Driscoll sent specifications for the engines to the Schenectady Locomotive Works the superintendent, an old friend, replied that they "did not build engines to climb trees."

The engines were built by the Baldwin Locomotive Works and until the new ones were ready two small engines were inspected and bought by Mr. Driscoll from a Rocky Mountain road that was changing to a wider gauge.

When Mr. Driscoll retired, in 1912, he said "I have bought everything used on these roads down to the last pound of nails."

His knowledge of what was needed and what was owned was extraordinary. After a fire that consumed the round-house at Catskill Point, the insurance examiners accepted his statement of what was lost. Mr. Frank H. Osborn, the company's lawyer, said to one of Mr. Driscoll's daughters, "I have just seen the most remarkable feat of memory I ever witnessed. Your father sat there and told us everything that was in that building. He knew where everything was and just what had been used."

A man of fine physique and excellent health, who had lived wisely and spent much of his time out of doors, Mr. Driscoll was seventy-five years old when he retired. He had been in the habit of walking the 7000 feet incline of the Otis to examine personally the condition of the great cable. But he had been under a long nervous strain as the roads began to fail and more and more of the business was done by motor cars. His doctor advised a complete change of environment and of interest and on Thanksgiving Day in 1912, he sailed with his oldest daughter for Italy where he spent the winter. His daughter tells a story of their first visit to St. Peters when Mr. Driscoll walked by many things that interested her and stood under the dome which he studied thoughtfully. Then she heard him say softly, "I see how he did it!" and she says it brought Michael Angelo right down into the twentieth century.

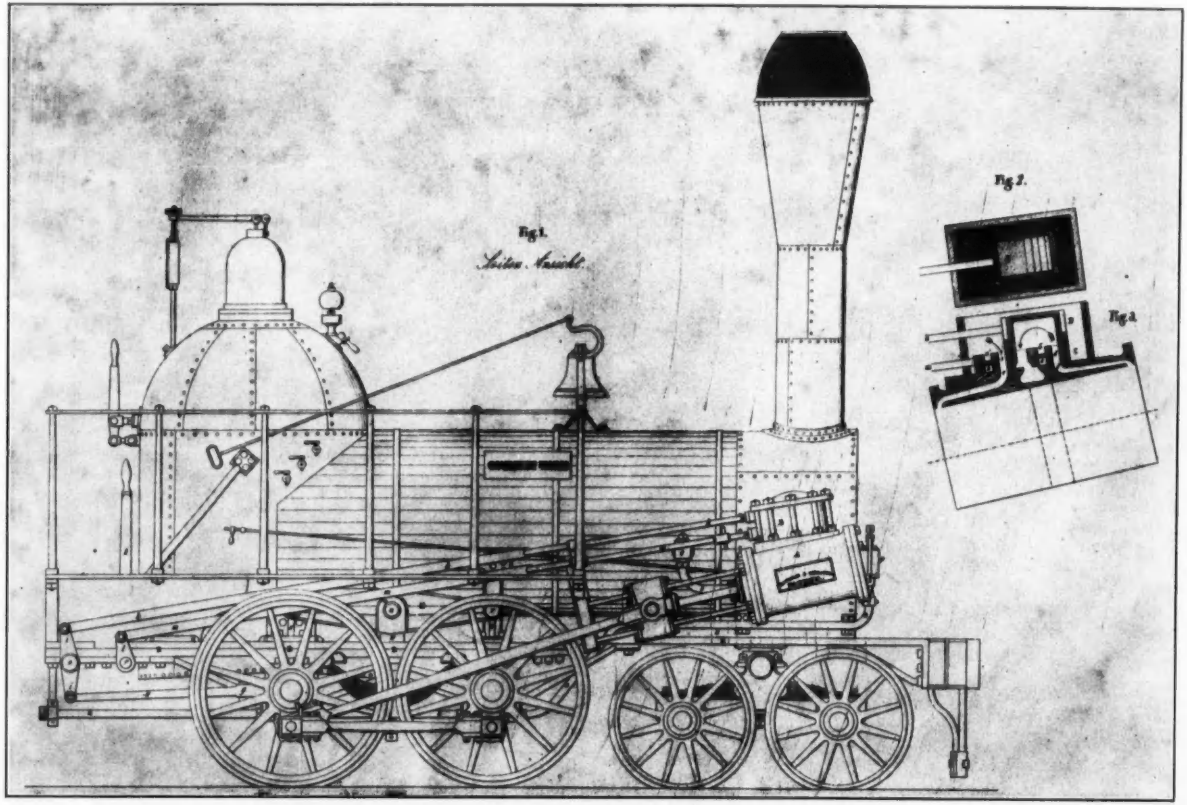
After a happy winter in Italy they traveled slowly toward England and when they came home his health was quite restored. It was at this time he turned to his woodworking and established a small shop in the garden of his home where he copied old mahogany furniture with fidelity. His daughters now own seven Chippendale chairs, one of which is an original; and many other pieces of fine furniture that he fashioned for them.

As his eyesight began to fail he remained interested in the world and was kept constantly aware of what was going on by being read to for hours daily. He was eighty-five when he underwent an operation for cataracts that was wholly successful. He was the oldest person who had undergone that operation in the Brooklyn Eye and Ear Hospital at that time. The physician who examined him before the operation said "I shall be thankful if I am in as good condition at sixty."

Unlike many aged persons he has never grown censorious and has kept a great sympathy for youth. He says he cannot remember a time when old people approved of young people. He is also a strong believer in letting people alone. When speaking on his hundredth birthday to a group of men who did him honor, he said he was increasingly convinced that a great many things were none of his business.

The employees of the old roads have formed an organization known as the JOHN L. DRISCOLL ASSOCIATION and frequently join with the Masonic Lodge in remembering him. In November of 1939 Mr. Driscoll attended a celebration given for him at the Masonic Temple when he was presented with a gold palm and medal for having been a Mason for seventy-five years. He was able to stay through the evening, meeting and remembering persons he had not seen for a long time and placing the men who came to him to greet him. He retains a clear mind and a good sense of humor, reads the daily papers and enjoys the radio. He does not look his age, having retained a fine, clear complexion with very few wrinkles. Perhaps the pleasantest thing said to or of him lately came in a letter from Owen D. Young who wrote him in the fall of 1939, congratulating him, "not on having reached a great age but upon having been able to make friends with succeeding generations."

EDITOR'S NOTE:—In January, 1936, John Leonard Driscoll was made an Honorary Member of this Society. His biography, prepared by his daughter, will be of genuine interest. He has seen the locomotive and the railroad from its crude beginnings to its present day efficiency. We are honored to have him in our midst.



Philadelphia & Reading R. R. "Gowan & Marx." Eastwick & Harrison, 1839.
From a drawing made in Germany showing the reversing mechanism.

The Development of the Anthracite-Burning Locomotive

By Paul T. Warner

During the latter part of the eighteenth century, the pioneers living in certain sections of eastern Pennsylvania became much interested in a peculiar mineral known as "stone coal" or "black stone". As early as 1768 it was known that it had combustible properties; but owing to the difficulty in igniting it, the abundant supply of wood fuel available, and the poor transportation facilities of that time, its use spread slowly. Records indicate that it was being used for blacksmithing in 1769, and that deposits were located near Mauch Chunk in 1791. In 1803 a load of stone coal was taken to Philadelphia, and attempts were made to burn it in the boiler of a steam engine at the water works; but as the fire was extinguished in consequence, the coal was broken up and scattered over the sidewalks in place of gravel.

Stone coal—now known as anthracite, or hard coal—was first placed on the market in 1807, when a certain Abijah Smith loaded 50 tons of it in an "ark" at Plymouth, near Wilkes-Barre, and floated it down the Susquehanna to Columbia, Lancaster County, where he tried to sell it; but there were no buyers. In the following year, one Jesse Fell made the experiment of burning stone coal in the fire place in his home, and reported that "it made a clearer and better fire, at less expense, than burning wood in the common way."

Anthracite was first mined by the use of powder in 1818, and thereafter its production rapidly increased. In that year the Lehigh Navigation Company was organized, and the coal was soon being regularly floated down river to Philadelphia in unwieldy boxes called "arks", which were steered by long oars or sweeps. As it was difficult to get the arks back, they were demolished after being unloaded, the lumber was sold, and the iron-work returned overland to Mauch Chunk, a distance of 80 miles. By the time the first railroads were in operation the value of hard coal as fuel was fully recognized, and one of Pennsylvania's greatest industries had become firmly established.

Anthracite is the densest, hardest and most lustrous of all coals, and its combustible content consists almost entirely of carbon. It burns with very little flame, and with practically no smoke. In contrast, a true bituminous coal contains a relatively large amount of so-called volatile matter which, on the application of heat, is driven off in the form of a gas. The principal constituents of this gas are hydrogen and carbon, and if the temperature is not sufficiently high, and the air supply is inadequate, the carbon deposits as soot, which forms the principal coloring matter in smoke. In any event the volatile matter burns, not *on* the grate, but in the space *above* it. For this reason anthracite is a slower burning fuel than bituminous coal, but the heating values of the two are practically equal. Hence to produce a given amount of steam in a given time we must burn as many pounds of anthracite as of bituminous, but as the

From a drawing made in Germany showing the reversing mechanism.

former burns more slowly, a far larger grate must be provided on which to consume it. The main problem with which the early designers of hard coal burning locomotives had to contend was that of providing sufficient grate area, and the story of the development of the hard coal burner deals chiefly with the struggle to solve this problem.

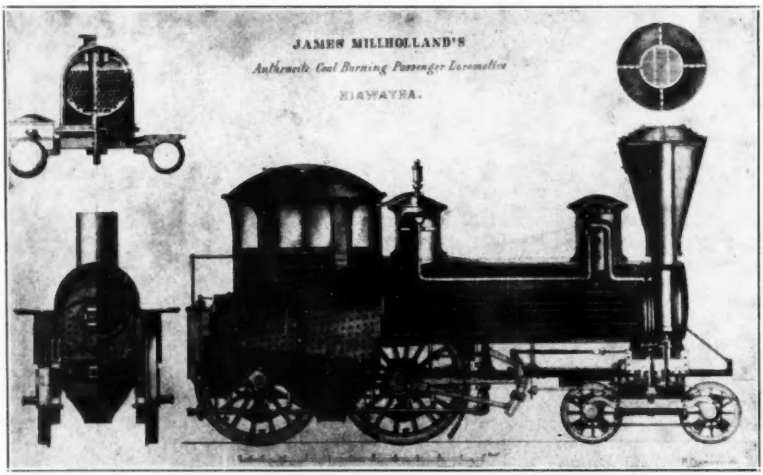
The first locomotive used in this country was the *Stourbridge Lion*, imported from England; and records state that when it was experimentally fired up at New York in June, 1829, Lackawaxen hard coal was used as fuel. It should also be noted that the first railroad to operate commercially in America—the Baltimore and Ohio—burned anthracite in its earliest locomotives. The *Tom Thumb*, built by Peter Cooper of New York, which made its first successful trip at Baltimore on August 28, 1830, was a hard coal burner. History records that the boiler of this little machine was of the vertical multi-tubular type, about 20 inches in diameter and five or six feet high. Artificial draft was created by a fan driven by a belt passing around a wooden drum attached to one of the road wheels, and a pulley on the fan shaft. It was the slipping of this belt that caused the first locomotive "steam failure" in this country, on that memorable day when the *Tom Thumb* was racing a gray horse, attached to another car on a parallel track.

Ross Winans, in a report made to P. E. Thomas, President of the Company, estimated that the *Tom Thumb*, while running, developed an average of 1.43 horsepower.

The success of the *Tom Thumb* convinced the management that it would be advisable to operate the road by steam power, and on January 4, 1831, the Company issued a proposal for the construction of locomotives, which was the first of the kind to be made in the United States. It was agreed that the sum of $4000.00 would be paid for the most approved engine, and $3500.00 for the next best. Among the stipulations included in the agreement were the following:—

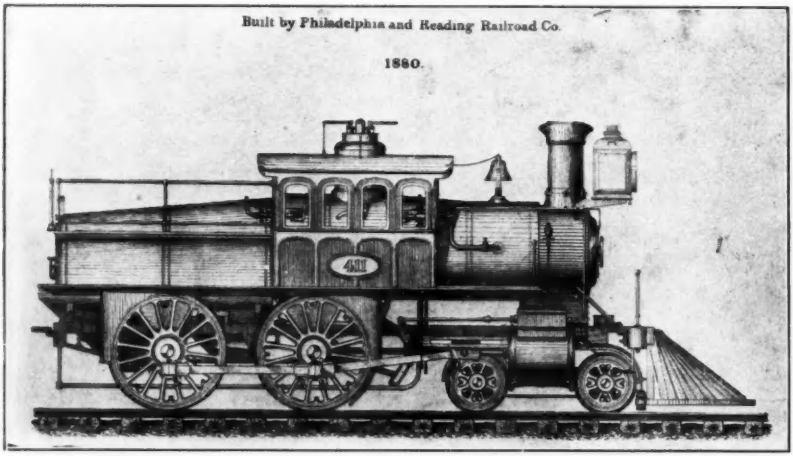
> "The engine must burn coke or coal, and must consume its own smoke."
>
> "The pressure of the steam not to exceed 100 pounds to the square inch; and as a less pressure will be preferred, the company in deciding on the advantages of the several engines will take into consideration their relative degrees of pressure. The company will be at liberty to put the boiler, fire tubes, cylinder, etc., to the test of a pressure of water not exceeding three times the pressure of the steam intended to be worked, without being answerable for any damage the machine may receive in consequence of such test."
>
> "There must be two safety valves, one of which must be completely out of reach or control of the engine man, and neither of which must be fastened down while the engine is working."
>
> "There must be a mercurial gauge affixed to the machine with an index rod showing the steam pressure above 50 pounds per square inch, and constructed to blow out at 120 pounds."

Several locomotives were built in answer to this proposal, but only one—the *York*—proved at all satisfactory. This locomotive was built by Messrs. Davis and Gartner, of York, Pennsylvania. It was capable of hauling 15 tons at a speed of 15 miles an hour on level track, and of running at a maximum speed of 30 miles an hour. The cylinders were vertical, as was also the boiler, which had an internal, horizontal water table nicknamed a "cheese", for the purpose of increasing the heating surface. This "cheese" gave trouble by filling up with mud and burning out.



—Courtesy of the Reading Co.

P. & R. "Hiawatha." Reading Shops, 1859. 25.2 long tons.



Philadelphia & Reading R. R. No. 411. One of the first of this type with the Wootten Firebox built at the Reading Shops, 1880.

Anthracite was used as fuel, and artificial draft was furnished by a fan.

The *York* was followed by a group of vertical boiler locomotives which were known as either "Grasshoppers" or "Crabs", according to the design of their machinery. The Grasshoppers had vertical cylinders, with vibrating beams which were fulcrumed on top of the boiler; while the Crabs (which were a creation of Ross Winans) had horizontal cylinders. The boilers of all these locomotives were of the multitubular type, burning anthracite and fitted with blowers operated by exhaust steam. The Crabs also had feed-water heaters, through which the exhaust steam passed before it was discharged into the atmosphere.

In the Seventh Annual Report of the Company, issued in 1833, George Gillingham, Superintendent of Machinery, referred to the Grasshopper *Atlantic* as having run 13,280 miles, burning 190 tons of coal at $8.00 per ton. This represented an average consumption of 32 pounds per mile.

These vertical boiler curiosities exerted but little influence on the development of the American locomotive, but because of their unusual design, and the fact that they successfully burned anthracite, they are deserving of brief mention.

We now turn to the State of Pennsylvania, where there was under construction a railroad which was destined to play a leading part in the hauling of anthracite and the development of the hard-coal burning locomotive. This was the Philadelphia and Reading, which was built chiefly for the purpose of transporting coal from the mines in the anthracite region to tidewater on the Delaware River. The line between Reading and Philadelphia was completed in 1839, and the extension to Pottsville was opened in 1842. For practically the entire distance the line had a river grade, either level or slightly descending, from the mines to tidewater. The grades were favorable to the loaded movement, and presented no serious obstacle to the hauling of empties on the return trip.

The first locomotives used by the Reading burned wood, but in 1839 the road placed an order with Messrs. Eastwick and Harrison, of Philadelphia, for a high-powered freight engine to burn anthracite. This engine, the *Gowan and Marx,* was one of the most famous locomotives ever built. At the time of its construction, Eastwick and Harrison had acquired an excellent reputation as locomotive builders. This was largely due to the invention, by Joseph Harrison, Jr., of the equalizing beam, patented April 24, 1838, which made it possible to build coupled locomotives that were sufficiently flexible to operate safely on the poorly surfaced tracks of the period. Eastwick and Harrison had built a number of hard-coal burning locomotives which were operating with a fair degree of success, notably on the Beaver Meadow Railroad.

The *Gowan and Marx* was of the 4-4-0 type, designed to weigh 11 tons, with 9 tons on the drivers. This unusual weight distribution was obtained by placing the firebox over the rear driving axle and using a short boiler barrel and wheel base, thus throwing the center of gravity as far to the rear as possible. The firebox was of the Bury, or hay-stack pattern, with a grate area probably approximating 12 square feet, which was considered exceptionally large. As in most of the Eastwick and Harrison locomotives, the cylinders were placed at a steep angle, and the pistons were outside-connected to the rear pair of drivers. The exhaust

steam was discharged into two copper chests, or draft boxes, and escaped up the stack through a large number of openings instead of through a single nozzle. The object sought was to create a more even draft on the fire. In May, 1839, the Committee on Science and the Arts of The Franklin Institute had investigated the performance of an Eastwick and Harrison hard-coal burner. Their report, referring to the draft boxes, stated that "with the aid of this contrivance, the anthracite fire is kept in a state of intense activity, and generates an abundance of steam, without the annoyance and danger arising from the smoke and sparks of a wood fire".

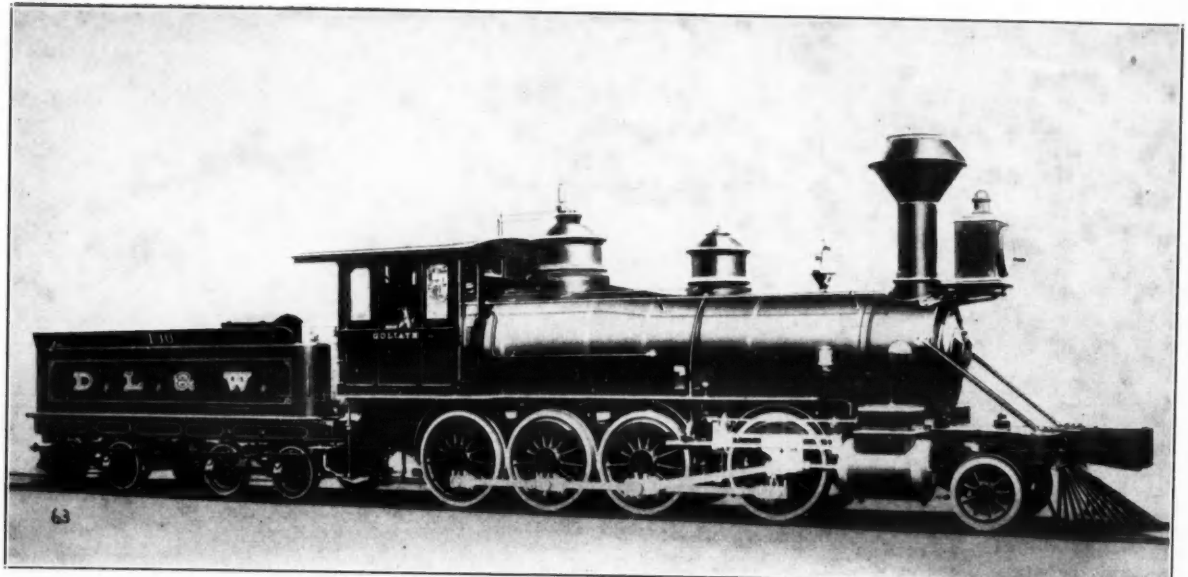
The locomotive mentioned in this report was operating at Philadelphia, but unfortunately no reference is made to the name of the engine or to the road for which it was built.

The grates of the locomotive just referred to consisted of grooved wrought iron bars, which were protected from the action of the fire by a coating of clay placed within the grooves. The grates of the *Gowan and Marx* were doubtless constructed in the same way. The latter locomotive was also the first one to be equipped with a blower for stimulating the fire.

On February 20, 1830, the *Gowan and Marx* startled the railroad world by hauling a train of 104 loaded four-wheel cars weighing 423 tons, from Reading to Philadelphia at an average speed of 9.82 miles an hour. Including the weight of the engine and tender, the total load equalled forty times the weight of the locomotive. A report of this remarkable run was issued by G. A. Nicolls, Superintendent of Transportation of the Railroad Company, under date of February 24, 1840. This report stated that the locomotive consumed 5600 pounds of red ash anthracite, while evaporating 2774 gallons of water. This represented an actual evaporation of 4.13 pounds of water per pound of fuel. It was also stated that "the steam ranged from 80 pounds to 130 pounds per square inch, to which latter pressure the safety valve was screwed down." With 130 pounds pressure, the locomotive must have been exceedingly "slippery". Mr. Nicolls described the engine as having cylinders measuring 12 2/3 by 16 inches, and driving wheels 40 inches in diameter; and he gave the total weight as 24,660 pounds, with 18,260 pounds on drivers.

The *Gowan and Marx* was a success, and twelve locomotives of similar design were ordered in 1842 from the Locks and Canals Company of Lowell, Massachusetts, and were delivered in 1843; but it was evident that, for reliable service, increased grate area was needed for burning such a refractory fuel as anthracite. Mr. Nicolls tackled the problem, and the result was an amazing creation which was built at the Reading Shops in 1846 and was appropriately named *Novelty*. The details were worked out by Lewis Kirk, who at that time was Master Mechanic. The engine and boiler of this curiosity were mounted on separate vehicles, the idea being that they could not both be placed on the same set of wheels and made of sufficient capacity. The *Novelty*, although a courageous venture, proved a complete failure and exerted no influence on locomotive design.

The next step to produce a successful hard-coal burner was taken by Ross Winans, of Baltimore, who was proving a prolific designer of railroad motive power. In 1847 he built four locomotives of the 0-8-0 type



D. L. & W. "Goliath" No. 130. Baldwin, 1876. —Courtesy of Baldwin Locomotive Works.

for the Reading. The firebox was of the Bury, or hay-stack pattern, but in order to provide sufficient grate area it had a flat-sided, rearward extension, rectangular in cross-section. This construction resulted in a heavy overhang, throwing an excessive amount of weight on the rear wheels. To obviate this, Winans placed a pair of pony wheels under the foot plate and the locomotives were then accepted. They had a grate area of 17.66 square feet, and burned anthracite more successfully than any locomotives previously tried. In spite of the progress made, however, the year 1850 found the great majority of the Reading's locomotives still burning wood.

The next steps in the development of the hard-coal burner were taken by James Millholland who, in the late forties, was placed in charge of the Mechanical Department of the Reading. He was an inventive genius and an excellent mechanical engineer; and while he made mistakes, he turned out locomotives which had no superiors at the time of their construction. In a report of Superintendent Nicolls dated December 1, 1851, it is stated that "satisfactory results have been obtained from the application of an improved method of burning anthracite coal in locomotives, invented by James Millholland, Master Machinist, by which the quantity of coal consumed and the intensity of the fire are alike diminished.

"The successful experience of this improvement for several months, in five engines, has established its value, and proved that anthracite coal is, at present prices of wood, the most economical fuel we can use in engines adapted to its combustion."

Quoting further from the same report, we read:—

"The 'Allegheny' engine has been completely rebuilt, in place of an engine of the same name, whose Boiler had proved defective from age and inferior iron. It has been built with Mr. Millholland's improvement, and has, so far, worked remarkably well."

This "improvement" was doubtless the one mentioned by Angus Sinclair on Page 289 of his book "Development of the Locomotive Engine", where he says—"The furnace was kept within the frame line until it reached the back of the hind drivers, when it was spread, reaching about five inches beyond the rail on each side." Dr. Sinclair states that the first engine so rebuilt was the Baldwin locomotive *Warrior*, but the Annual Reports of the Philadelphia and Reading Railroad Company indicate that the *Warrior* was not rebuilt until 1858. However that may be, it is interesting to note that in the *Railway Mechanical Engineer* of May, 1916, there was illustrated and briefly described a 4-6-2 type compound locomotive on the Paris-Orleans Railway of France, which had a firebox similar in plan to that attributed to Millholland by Sinclair.

On February 7, 1852, Millholland took out a patent for a locomotive boiler designed to burn hard coal. This boiler, in modified form, was applied to the freight locomotives of the *Pawnee* class, built at the Reading shops during that year. These locomotives were of the 2-6-0 type, but were not true Moguls, because the leading wheels were placed back of the cylinders and were held rigidly in the main frames. The boiler had an overhanging firebox with a short combustion chamber, and there was also an intermediate combustion chamber, thus necessitating the use of two groups of tubes. In design and workmanship these locomotives represented the best practice of their day, but they were poor steamers. Mill-

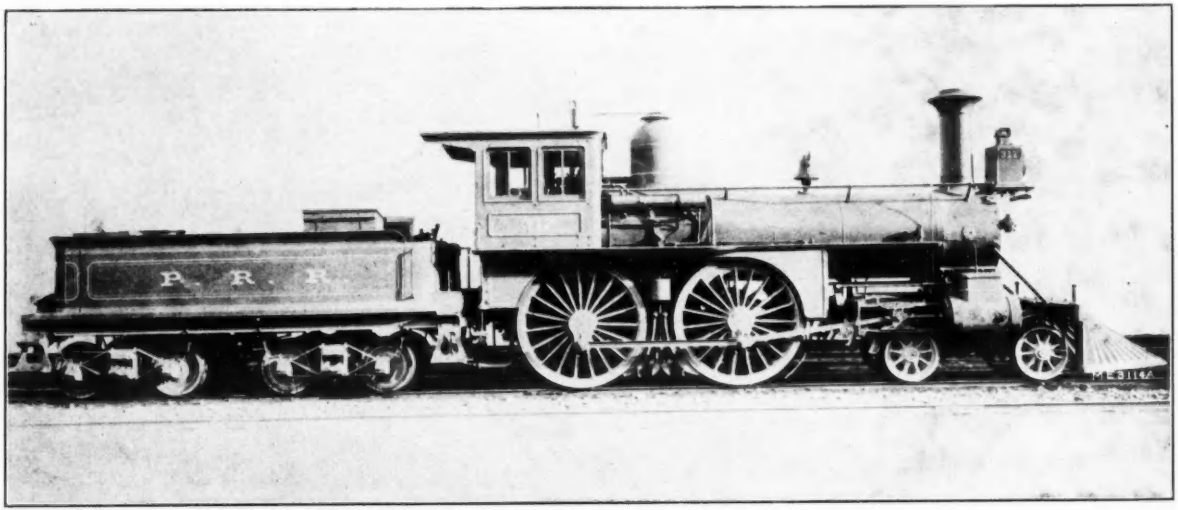
holland, following the ideas of the period, provided his coal-burners with an assortment of mixing chambers and ingenious gadgets which, while they may have been theoretically desirable, worked poorly in practice.

We must now leave the Reading for a time, and turn our attention to the Delaware, Lackawanna and Western Railroad which, although it was rapidly becoming important as an anthracite carrier, was using wood as locomotive fuel. Like the Erie, this road was originally constructed with a track gauge of six feet. The first hard coal burner built for the Lackawanna was ordered in October 1853, from Danforth, Cooke and Company, of Paterson, New Jersey, and was appropriately named *Anthracite*. This engine was completed in May, 1854. The design, for which Watts Cooke, subsequently Master Mechanic of the Lackawanna, was largely responsible, closely followed Millholland's *Pawnee* class. The wheel arrangement was the same, and the boiler was very similar in construction. The *Anthracite*, however, in its original form, gave no end of trouble. The locomotive would not operate safely on the crooked tracks of the Lackawanna, until the rigid leading wheels were taken out and a four-wheeled swivelling truck substituted for them. The locomotive was also a poor steamer. A very intense draft was found necessary, and this pulled the coal through the rear tubes into the intermediate combustion chamber, which rapidly filled up, choking the tubes and causing steam failures. It was necessary to remove the intermediate combustion chamber before the locomotive could be made to steam satisfactorily.

The second hard coal burner used on the Lackawanna was the *Carbon*, built by the ingenious Ross Winans of Baltimore, and placed on the road in October, 1854. This was a genuine Winans "Camel," and was representative of one of the most unusual types of locomotives ever used in this country. The wheel arrangement was 0-8-0, and the boiler had a long overhanging firebox. The crown and roof sheets sloped toward the rear at a sharp angle, and there was practically no steam space above the crown. The grates were of cast iron, arranged so that each bar could be shaken independently of the others. In addition to the firedoors at the rear, there were two "chutes" on top, through which coal could be dumped on the grates. A huge dome, almost as large in diameter as the boiler itself, was placed just back of the smokebox. The connection of this dome with the barrel was a serious source of weakness, and the Camels were subject to rather frequent explosions.

Five additional locomotives of this type, but of somewhat larger dimensions, were placed on the Lackawanna in 1856. When operated at slow speed they were fairly successful, but they soon failed at speeds exceeding ten miles an hour. All were scrapped in 1859, as they were considered unsafe to operate.

The next Lackawanna engine demanding our attention was the *Lehigh*, built by the New Jersey Locomotive Works of Paterson, and completed in February, 1855. This engine was originally designed by Zerah Colburn, who was one of the most noted mechanical engineers of the period. It was of the 0-6-0 type, with an overhanging firebox of 7′ 6″ in width. Colburn's intention was to use a firebox six feet long, but he left the New Jersey Locomotive Works before the *Lehigh* was completed, and the builders reduced the length to 4′ 6″. The locomotive



Pennsylvania R. R. No. 317, Altoona, 1881, Class "K." Built for Fast Passenger Service.

proved a poor steamer, and the firebox was subsequently lengthened to six feet, as proposed by Colburn.

Five additional locomotives of the *Lehigh* type were ordered from the New Jersey Locomotive Works in 1856, and all of them were partially rebuilt with longer fireboxes about two years later.

The first really successful anthracite burners used on the Lackawanna were the *Investigator* and *Decision*, which were turned out of the shops of Danforth, Cooke and Company in April, 1857. They were of the 4-6-0 type for freight service, and had wide overhanging fireboxes placed back of the rear drivers.

The Philadelphia and Reading, in the meantime, was having some interesting experiences with Winans Camels. Eleven of these remarkable locomotives were in use on the road in 1852; fifteen more were purchased in 1854, at a cost of $150,000, and in the following year 17 more were bought for $165,000, making a total of 43. As originally built, the Camels had no water space in the back of the firebox; and side sheets, especially those of iron, failed frequently. Copper side sheets proved more reliable, but there was no marked improvement until Millholland rebuilt the fireboxes with a back water space. This change also permitted him to put in water-tube grates, which proved more durable than cast iron grates. With the latter, it was found preferable to use an inferior grade of anthracite, as the resulting accumulation of ash and cinder protected the cast iron bars from the intense heat of the fire. With high grade fuel of low ash content, the bars burned out rapidly, but this difficulty was avoided with the water-tube grate.

It is difficult for us today to appreciate the problems which had to be solved by the men who designed these early hard-coal burners. They realized the need for ample grate area, but had many trials and tribulations in trying to obtain it. A low center of gravity was considered essential, and hence the boiler was carried at the lowest possible elevation. A firebox with sufficient grate area for burning wood could be placed between the frames and axles, but such a location provided insufficient space for an anthracite-burning firebox. Apparently the only alternative was to use an overhanging firebox, and this resulted in a locomotive that was liable to rock and prove unsteady on the track when run at more than moderate speed. The frames were usually stopped in front of the firebox, and hence it was difficult to provide a satisfactory connection between the locomotive and tender. In many cases the tender drawbar was attached to the ash pan, which in turn was braced to the frames at its forward end. This was, to say the least, a most unmechanical arrangement, but it apparently served the purpose fairly well.

The problem was finally solved, on both the Lackawanna and the Reading, by raising the boiler and placing the firebox above the rear driving axle. Millholland placed his grates above the frames, thus obtaining an area of 24½ square feet in a firebox seven feet in length. He developed locomotives of the 4-4-0 type for passenger service, and the 4-6-0 for freight, that had no superiors at the time of their construction. In the report of Superintendent Nicolls dated November 30, 1859, we read:—"The two new coal-burning passenger engines *Hiawatha* and *Minnehaha*, have been completed, and in use for some months. In

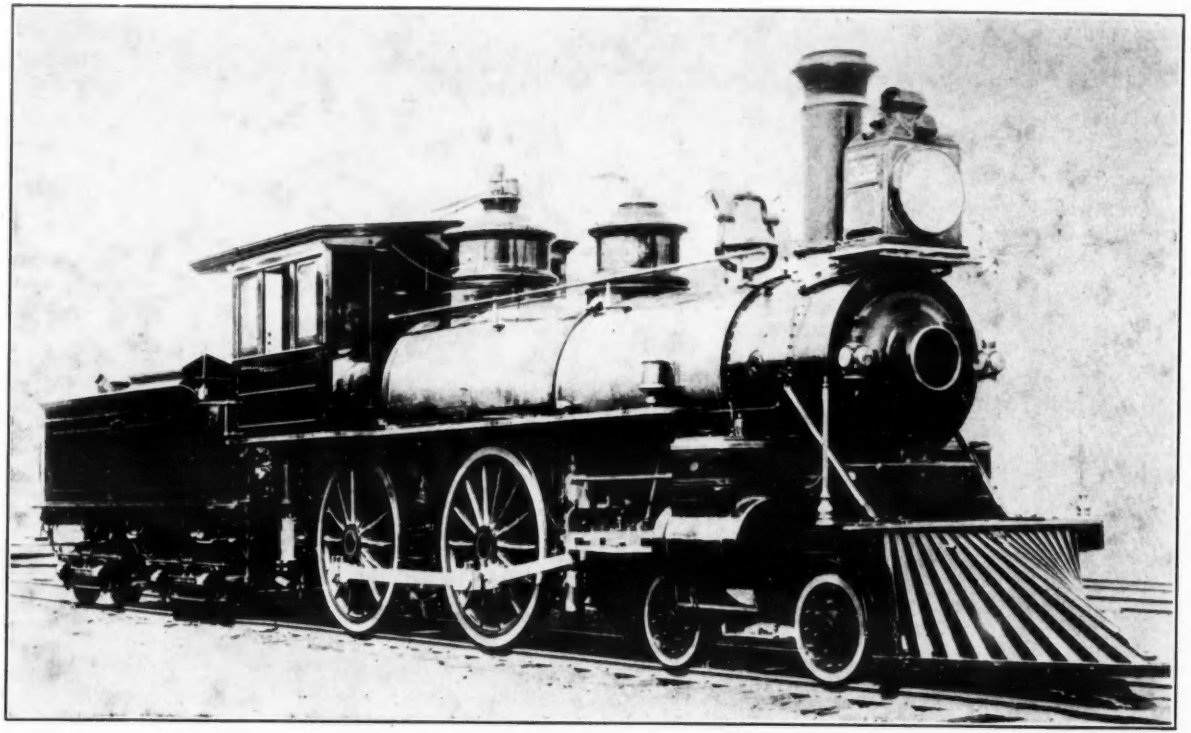
economy of fuel and repairs, and general efficiency, these locomotives have proved superior to any yet used, and are believed to furnish an excellent model for others which may be hereafter required for similar service". This proved to be a fact; for the Reading designs of the late fifties continued to be built, with comparatively little variation, until the advent of the Wootten boiler in 1877. Millholland's locomotives had boilers with radial-stay fireboxes, water-tube grates, and two steam domes. An inspection of the drawings of the *Hiawatha* shows that such features as sloping throats and back heads were not unknown at that time, and reveals a boiler which was quite as "crooked" in appearance as any built during recent years.

Under date of December 13, 1859, Millholland addressed a most interesting report, covering the subject of anthracite as locomotive fuel, to R. D. Cullen, then President of the Philadelphia and Reading Railroad Company. The report stated that there were only four wood-burning locomotives left on the railroad, and that the coal burners were far easier to manage than the wood burners, as they had to be fired only every 40 minutes. With full trains of 100 loaded cars carrying five tons per car east-bound, and 110 empties westbound, the coal consumption for the round trip of 190 miles was nine tons.

As compared to a soft-coal burner of the same nominal capacity, the hard-coal burner of the sixties and seventies was somewhat heavier, with a larger percentage of total weight resting on the driving wheels. This was particularly true of the 4-4-0 and 4-6-0 types, which were built in large numbers; and was due to the long firebox of the hard-coal burner, which extended over the back driving axle, throwing the center of gravity toward the rear. The additional weight on drivers was an advantage in the case of locomotives inclined to be "slippery". The grates of the hard-coal burners were composed of water tubes about two inches in diameter, and in a firebox of the usual width two or three "pull-out" bars were inserted. These rested in thimbles placed in the water legs, or sometimes, at the front of the grate, on suitable bearing castings; and they could be drawn out when dumping the fire. The usual ratio of grate area to heating surface was about 1 to 40, as compared with 1 to 60 in a soft-coal burner.

Stacks of various kinds were used on the hard-coal burners—straight stacks, diamond stacks, sun-flower stacks, and even Laird balloon stacks, were tried at various times and in accordance with the ideas of master mechanics. The straight stack finally prevailed, and became practically universal before the final discarding of the diamond stack on soft-coal burners.

Variable exhaust nozzles were almost universally used on anthracite burning locomotives sixty or more years ago. Probably the most common type had an internal plug, which could be raised or lowered within the nozzle, thus varying the size of the annular opening through which the steam escaped. The Bolton nozzle consisted of flexible steel plates, surrounded by a cast iron ring, which could be raised or lowered, thus allowing the plates to spring apart or be drawn together, and varying the size of the opening. Ross Winans, in 1847, patented an exhaust which was used, at least to some extent, in his Camel engines. The opening in the nozzle was rectangular in cross section, and its width



Lehigh Valley No. 382, "William Conyngham." Wilkes-Barre Shops, 1882.

could be varied by changing the distance between two vertical plates. The device was operated through gearing, by a handle placed in the cab. According to Herbert T. Walker, this type of exhaust nozzle was applied to the Lackawanna Camels. The operating handle in the cab was derisively known as the "coffee mill." The device would frequently clog with cinders and become inoperative, the result being a surprising amount of railroad profanity. It was therefore customary to set it at a point which gave generally satisfactory results, and let it stay there.

The year 1866 is of special interest, because it marked the introduction of the so-called Consolidation type of locomotive. The original "Consolidation"—the first 2-8-0 type with separate tender—was built by the Baldwin Locomotive Works to specifications prepared by Alexander Mitchell, Master Mechanic of the Lehigh and Mahanoy Railroad. At the time of its construction, the Lehigh and Mahanoy was being consolidated with the Lehigh Valley, and the locomotive was named "Consolidation" in honor of the event. The name stuck to the type. Although Matthias W. Baldwin predicted the failure of Mr. Mitchell's new engine, it proved a great success; and the Lehigh Valley took a leading part in the development of the Consolidation type for heavy coal and freight traffic. In order to obtain sufficient grate area for burning anthracite, these locomotives had fireboxes ten feet long. The big Consolidation type of the seventies had 20x24-inch cylinders and driving wheels 50 inches in diameter, and weighed about 100,000 pounds in working order. The preference of the Lehigh Valley for these large locomotives was due to the fact that there were heavy grades on its main line, up which coal had to be hauled while moving east-bound from the mines. The Reading, as has been mentioned, was more favorably situated in this respect, having a descending river grade east-bound over practically its entire main line. It was handling coal traffic with Millholland Ten-wheeled (4-6-0 type) engines. These were popularly known as "gun boats", and they weighed 25 to 30 per cent less than the Consolidation type locomotives.

In a report of John P. Laird, Master of Machinery of the Pennsylvania Railroad, dated December 31, 1862, it was stated that experiments were being made with a passenger locomotive designed to burn anthracite, and that the relative merits of hard and soft coal as locomotive fuel were being thoroughly tested. In the report of the following year, it was stated that the hard-coal burner had not proved successful, and that it had been rebuilt to use bituminous coal and was "doing very well". This was probably the Pennsylvania's first, but by no means only experience in the use of anthracite.

In June, 1871, the Pennsylvania leased the lines of the United New Jersey Canal and Railroad Company; and for many years thereafter it owned and operated a large number of hard-coal burners. The first "standard" design of hard-coal burner was Class C Anthracite (subsequently Class D4) which was turned out in 1873. This was a 4-4-0 type engine which, apart from its boiler, was practically a duplicate of Class C (or D3), a soft-coal burner which was then the most successful all-around passenger and fast freight engine on the railroad. As compared with Class C, the grate area of the hard-coal burner was increased 63 percent, and the total heating surface, 7 percent. This

latter increase was the result of using a larger number of tubes of reduced diameter. The total weight of the locomotive was slightly increased, while the weight on drivers was raised about ten per cent.

In 1876 John E. Wootten, then General Manager of the Philadelphia and Reading, became interested in the problem of using refuse anthracite as fuel. In a statement dated December 21, 1876, published in the Annual Report of the Company for that year, he says:—"An important economy, introduced during the year, has been the utilization of coal dirt, from the waste heaps at the mines, for generating steam in stationary boilers at the shops and at stations on the line. A locomotive using this fuel is also doing efficient service. Nearly seven-thousand tons of this waste material has thus been profitably consumed during the year".

Mr. Wootten was seriously tackling the problem of burning refuse coal in locomotives; and in January, 1877, the first locomotive with a boiler specially designed to burn this fuel was turned out of the Reading Shops. This engine, No. 408, was of the 4-6-0 type for freight service, with 18x24-inch cylinders and driving wheels 54 inches in diameter. Application was made for a patent covering the new type of boiler, and this patent—No. 192,725—was granted July 3, 1877. It had one claim, reading as follows:—

> A locomotive engine in which a firebox wider than, and a grate as wide as or wider than, the distance between the driving wheels, and arranged above the same, are combined with a bridge M, extending across the said firebox, and with the auxiliary combustion chamber, all substantially as set forth.

This patent was followed by another, No. 254,581, dated March 7, 1882, which illustrated a boiler similar to that shown in connection with the first patent. The principal claim of the second patent was that the entire firebox should be *above* the bottom line of the waist or barrel of the boiler.

The design of the Wootten boiler showed considerable ingenuity. In order to burn refuse coal successfully it was necessary to carry a thin fire and work it with a light draft, and this necessitated a grate area far larger than could be obtained in a firebox placed between the wheels. At the same time there was a strong prejudice against raising the boiler, the fear being that such a plan would render the locomotive unstable and liable to upset when rounding curves. Mr. Wootten therefore, while extending his firebox beyond the wheels and raising it above them, used an extremely shallow throat, in combination with a combustion chamber which extended forward into the boiler barrel. There was a raised water space, surmounted by a fire-brick wall, across the rear of the combustion chamber, and this permitted the watertube grate to be placed entirely above the bottom line of the boiler barrel. Owing to the width of the firebox, two fire-doors were provided. The crown sheet of the firebox was horizontal, but the roof sheet sloped toward the rear at a fairly steep angle, providing very little steam space at the back. The mud ring, or water space frame, was made of flanged plates shaped like an inverted U, and carefully fitted and riveted to the inside and outside firebox shells. The firebox was supported on the frames by means of vertical expansion links at the front and back. A

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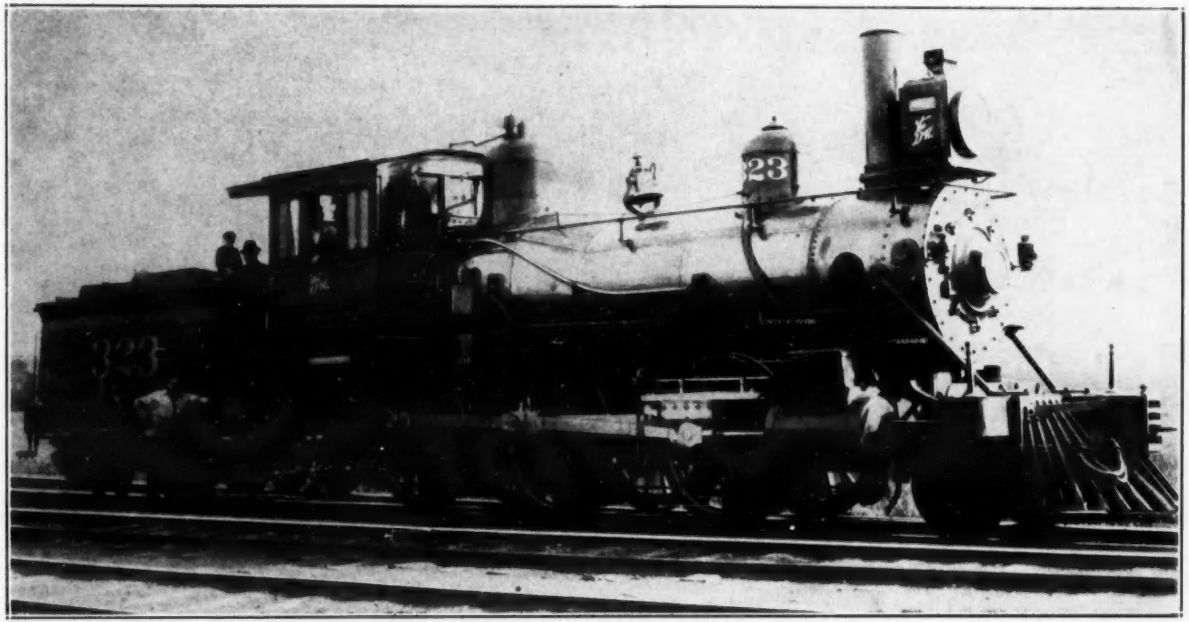


Delaware & Hudson Co. No. 323. Dickson Mfg. Co. No. 830, 1891.
18x24" 62" 115000 Pressure 180 lb.

—Courtesy of W. J. Coughtry.

short smokebox was used, with a variable exhaust nozzle and a register in the front door for the admission of air.

Two other patented devices of Mr. Wootten's were applied to engine 408. One was a grate composed of water tubes between which were placed cast iron bars having narrow air openings. The other was a feed-water heater, consisting of a long cylindrical drum traversed by tubes through which part of the exhaust steam passed. A pump, worked from a return crank attached to the rear crank pin on the right hand side, forced water into the drum, where it absorbed heat from the exhaust steam. The condensate was drained through a pipe at the back end of the drum.

Engine 408 proved successful, and was followed by others of similar design. One of them, No. 412, was sent to Europe and exhibited at the Paris Exposition of 1878. It was subsequently tried on the Northern Railway of France and also on several Italian roads, where it burned low grade fuel with marked success.

In the first Wootten boiler locomotives constructed, including engine 412, the cab was apparently placed over the firebox. On account of restricted clearance limits on the Northern Railway of France it was necessary, before placing the locomotive in service on that line, to move the cab ahead of the firebox so that it could be lowered. This was probably the first of a long series of locomotives subsequently nicknamed "Camel-backs" or "Mother Hubbards".

While the records indicate that Wootten boiler locomotives for passenger service were built at Reading as early as 1878, the first of such locomotives to be fully illustrated and described in the technical press was apparently engine 411, which was turned out of the Reading Shops in May, 1880. A similar engine, No. 506, followed in June. The writer has distinct recollections of both these locomotives, and he has ridden behind them on the Bethlehem Branch. They were of the 4-4-0 type, and were the heaviest passenger locomotives in the country at the time of their construction; and they set the pace for high-speed motive power, not only on the Reading, but also on other railroads. Their cylinders had the unusual dimensions of 21x22 inches; the drivers had a diameter of 68 inches, and the steam pressure was 140 pounds. The boiler was of the full-fledged Wootten type, with a grate area of 76 square feet.

Engines 411 and 506 were placed in fast passenger service on the New York line, operating between Philadelphia and Bound Brook. It was customary to change engines at the latter point, using the locomotives of the Central Railroad of New Jersey between Bound Brook and Jersey City. The Reading locomotives made two round trips, aggregating 240 miles, per day. According to the late J. Snowden Bell the fastest schedule allowed 64 minutes for the 54.9 miles between Wayne Junction and Bound Brook, including one stop and three slow-downs. At full power 53 pounds of anthracite were consumed per minute, and 55 gallons of water were evaporated. In this severe service, each engine crew consisted of three men, one of whom served as "furnace-door opener"; "an operation"—according to Mr. Wootten—"which facilitates rapid firing". In regular service a speed of 72 miles an hour was maintained for a distance of eight miles; and on one occasion a

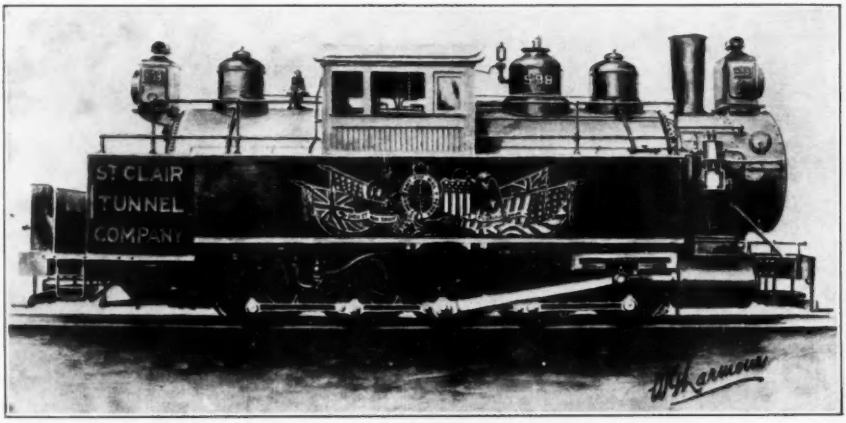
special train of 15 cars was hauled from Wayne Junction to Bound Brook in 76 minutes.

The first Baldwin-built engines to have Wootten boilers were heavy freight haulers of the Consolidation (2-8-0) type, constructed for the Reading in 1880. They were fitted with Mr. Wootten's patent feedwater heater, but curiously enough in this case the water was forced into the heater, not by a pump, but by an injector. In service these locomotives proved so satisfactory that they were soon followed by others of similar design. The General Manager's report dated December 31, 1881, stated that the cost of fuel per 100 ton-miles for the Ten-wheeled engines using prepared coal was 5-6/10 cents, while for the Consolidation using waste coal it was only 0-6/10 cents. This represented a saving in the cost of fuel per annum, for each Consolidation type locomotive, of about $2,500.00. During the year 1883, 171 locomotives using waste anthracite, reduced the fuel cost by $378,000.00. In addition to this, the firebox sheets lasted considerably longer in the Wootten boilers than in those of the conventional type, due to the fact that it was not necessary to force the fire so hard.

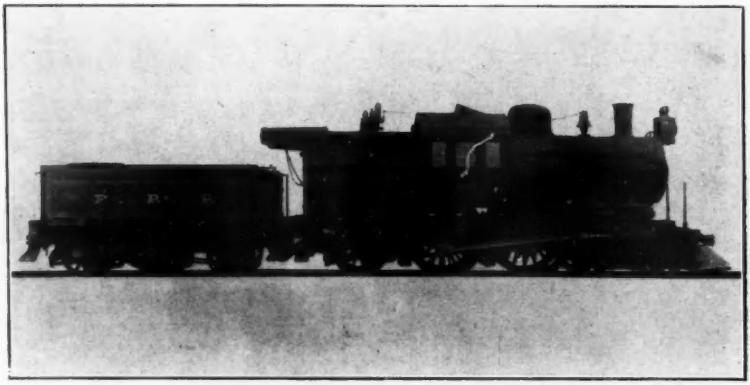
The refuse anthracite, as received from the mines, usually had mixed with it from 18 to 20 per cent of slate and other impurities. When the Wootten boiler was first introduced, an attempt was made to burn this fuel without washing it; but this necessitated cleaning fires so frequently that it was found desirable to remove the impurities before placing the fuel on the tenders. In fast passenger service, to insure greater cleanliness and free steaming, it was customary to burn lump coal; but it was not necessary to "size" it specially, as was the case with the narrow fireboxes, because the Wootten boilers burned any size from stove to steamboat.

In spite of the success of Mr. Wootten's new boiler, the majority of the roads in the anthracite region resisted its introduction. This was doubtless due, at least in a measure, to the fact that it was a patented device. The Lehigh Valley, in 1880, purchased two Wootten Consolidation type locomotives from the Baldwin Locomotive Works, but adhered to the long narrow firebox for passenger locomotives. This road was building the majority of its locomotives in its own shops, and each Master Mechanic was supposed to design motive power best suited to the requirements of his particular division. Locomotives were built at South Easton, Hazleton, Weatherly, Delano, Wilkes-Barre and Sayre; there were Kinsey engines, Campbell engines, Clark engines, Hofecker engines, Mitchell engines, anybody and everybody's engines. Apart from the fact that all burned hard coal, there was no attempt at standardization; the result, according to the late Angus Sinclair, being "the accumulation of an assortment of patterns such as no other railroad company ever possessed".

Lehigh Valley engine 382, the *William L. Conyngham*, built at Wilkes-Barre in 1882, was a fine example of a passenger lump burner. She was a particularly handsome 4-4-0 type, with 19x24-inch cylinders, driving wheels 68½ inches in diameter, and a grate 10½ feet in length having an area of 36.8 square feet. This engine, in its leading features and dimensions, was representative of the general class of passenger



St. Clair Tunnel Co. No. 598. Baldwin, 1891.



Pennsylvania R. R. No. 820, Class E-1, Altoona, 1899.

power used on the other principal hard coal roads, such as the Central of New Jersey and the Lackawanna.

The Pennsylvania, in 1881, introduced a new series of hard-coal burning locomotives, represented by Classes K and A anthracite, which were respectively used in fast and local passenger service on the New York Division. These locomotives were of the 4-4-0 type, and were designed under the supervision of the late Theodore N. Ely, who was then Superintendent of Motive Power. Class K (subsequently D6) had 18x24-inch cylinders, and was notable for the size of its driving wheels, which were 78 inches in diameter. Class A anthracite (subsequently D7) had 17x24-inch cylinders and 68-inch drivers. The boilers of the two classes were closely similar, with fireboxes ten feet long placed above the frames, and a grate area of 34.7 square feet. As far as the design of the details was concerned, these locomotives represented the most advanced practice of their day. They were handsome in appearance, and there was a refinement in their outline, and an absence of gaudy paint and brass work, that contrasted strongly with much of the power in service at the time. A heavier design, with larger cylinders and boiler, designated as Class P (subsequently D11a) was built in 1883 and for several years thereafter.

In fast passenger service on the New York Division, the Class K and Class P locomotives burned hard coal during the summer time and soft coal during the winter.

It is interesting to note that in 1883 the Baldwin Locomotive Works built, for the Denver and Rio Grande Railroad, three narrow gauge 4-4-0 type locomotives designed to burn Colorado anthracite. These little engines, with 12x18-inch cylinders and driving wheels 45 inches in diameter, had long narrow fireboxes, with grates composed of water tubes and pull-out bars. They were tried in passenger service, but as hard-coal burners they were failures, as they could not be made to steam.

The Wootten boiler, as originally designed and built, had certain features which were destined to give trouble. Due to the sloping roof sheet and the large area of crown sheet with its flat surface, there were frequent staybolt breakages. The flanged mud ring proved a source of weakness, as did the raised water space at the back of the combustion chamber, where seams were prone to leak. The Baldwin Locomotive Works gave valuable assistance in improving the design of the boiler and eliminating its weak points. The roof sheet was made horizontal, the crown sheet was arched all the way around except at the sides, and a solid mud ring of forged iron was substituted for the plate design. The arrangement of the throat was changed so that the raised water space in the combustion chamber could be eliminated, while retaining the water-tube grates and fire-brick wall.

The boiler, as thus improved, was applied to a group of 4-4-0 type engines built in 1889 and 1890, at which time Levi B. Paxson was Superintendent of Motive Power and Rolling Equipment of the Reading. Mr. Paxson did progressive work in developing the Wootten boiler, and also improving valve gear design by providing a freer exhaust and reducing back pressure. The 4-4-0 type locomotives referred to had the same size cylinders and driving wheels as the old 411 class, but the

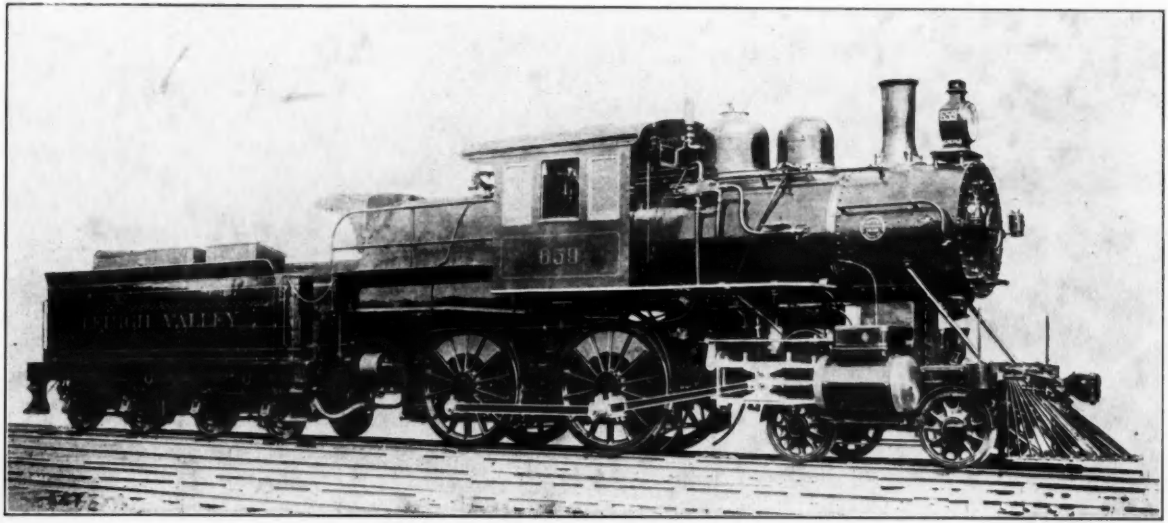
boilers were larger and the steam pressure was raised from 140 to 160 pounds. These locomotives proved a great success, demonstrating their ability, on special occasions, to maintain an average speed of 60 miles an hour between Camden and Atlantic City, and doing very creditable work on the New York run also.

In the meantime there was being developed the so-called modified type of Wootten boiler, which had a wide firebox without a combustion chamber. Mr. S. M. Vauclain, of the Baldwin Locomotive Works, gives chief credit to Alexander Mitchell of the Lehigh Valley, for perfecting this design. However that may be, it is interesting to note that a boiler of the modified Wootten type was applied to Baldwin engine No. 5000, an experimental single-driver engine built in March, 1880, for high speed service on the Bound Brook line. This locomotive had the 4-2-2 wheel arrangement, with a wide firebox placed back of the drivers and over the trailing wheels. The firebox was radially stayed, and had a straight tube sheet and watertube grate. The locomotive proved capable of maintaining high speed, but it made only a few trips on the Reading; and it was subsequently sold to Lovett Eames, who took it to England to exploit his patented vacuum brake.

The locomotive just mentioned had a deep firebox, with ample space between the grate and the bottom row of tubes; but when the modified Wootten design was first placed above the drivers, the throat was so shallow that trouble was experienced. The fuel choked up the bottom tubes, and cold air passing through the grate frequently caused them to leak. This difficulty was overcome by placing the tube sheet five or six inches ahead of the throat, thus causing the equivalent of a very short combustion chamber or, as it was called, a D-head. This kept the tubes out of the fire, and gave any cold air an opportunity to heat up before it struck the tube sheet. There was nothing new about the D-head, as it had been used for many years in narrow fireboxes. It was simply applying an old device to overcome a new difficulty.

Mr. Wootten took out several patents covering wide fireboxes with straight tube sheets. One of these described a curved brick wall placed on the grates and abutting against the tube sheet, thus keeping the fuel out of the tubes and forming a small combustion chamber. In another arrangement, the lower tubes were kept so far above the bottom of the boiler shell that the fuel could not get into them. This plan sacrificed a considerable number of tubes, with a corresponding reduction in heating surface. Mr. Wootten also took out a patent, jointly with J. Snowden Bell, under date of April 19, 1887, covering a wide firebox which was divided into two chambers by means of a longitudinal water-leg. The chambers united, at the front of the firebox, in a common combustion chamber which was separated from the grates by walls of firebrick. If this plan of firebox was ever actually used, the writer is not aware of it.

In addition to the railroads which have been thus far mentioned, many other lines in the east were using anthracite to a greater or less extent. Among these were the Central Railroad of New Jersey, the Erie, the New York, Susquehanna and Western, the New York, Ontario and Western, the Delaware and Hudson, the West Shore, the Long Island, the Erie and Wyoming Valley, and various smaller roads. The



Lehigh Valley R. R. No. 659. Baldwin, 1895. Modified Wooten Firebox for burning Anthracite.

New York Central and Hudson River burned anthracite in suburban service out of New York City, and the switching in the Grand Central Station was done with hard-coal burners.

The West Shore had in service two classes of 4-4-0 type locomotives which were alike except for the fireboxes, one class burning bituminous coal and the other anthracite. Both classes had 18x24-inch cylinders and driving wheels 68 inches in diameter, and carried a steam pressure of 140 pounds. Four of these locomotives, one of them a hard-coal burner, participated in a run made on July 9, 1885, with a three-car special train, from East Buffalo to Weehawken. The average speed while running was nearly 50 miles an hour, and the performance, at that time, was regarded as quite an achievement. The locomotives were built by the Rogers Locomotive Works, and the run is described in great detail in the 1886 edition of the Rogers catalog.

The success of the Wootten boiler, in both its original and modified forms, led to the re-boilering of many hard-coal burning locomotives originally having narrow fireboxes. If the drawings of these boilers could be studied, some interesting designs would be revealed. The Lehigh Valley, in a number of cases, built wide fireboxes with the Belpaire system of staying, the inside and outside firebox sheets being parallel to each other so that the staybolts were normal to both. This system of construction was subsequently used by the Pennsylvania Railroad in the boilers of its first Atlantic type locomotives, which will be described shortly.

Brief reference should here be made to a number of three-cylinder hard-coal burners, built for the Erie and Wyoming Valley Railroad. In 1880 Mr. John B. Smith, Superintendent of the Pennsylvania Coal Company, built four small switchers of the 0-4-0 type, each of which had three cylinders. While records of their dimensions and service are not available, they were apparently satisfactory; for in 1892 Mr. Smith constructed, at the works of the Dunmore Iron and Steel Company, a wide firebox, three-cylinder passenger locomotive of the 4-4-0 type, for the Erie and Wyoming Valley. This was followed, in 1894, by three freight locomotives of the Mogul (2-6-0) type, built by the Baldwin Locomotive Works. In this design there were three 17x24-inch cylinders set on an incline, with all the pistons connected to the second pair of driving wheels, and cranks placed 120 degrees apart. These locomotives had Wootten boilers carrying a steam pressure of 150 pounds, and developed a tractive force of 23,300 pounds. In proportion to their weight they demonstrated remarkable hauling capacity, especially on grades.

As far as the writer is aware, the only other three-cylinder hard-coal burners on record are those built by the Philadelphia and Reading at the Reading Shops during the years 1909-1912. Three of these were of the Atlantic type, while the fourth was a ten-wheeler. They all did fine work, but were subsequently rebuilt with two cylinders.

During the nineties the locomotive weight record was broken by three groups of anthracite burners, all built by the Baldwin Locomotive Works. First were the four 0-10-0 type tank engines, specially designed to operate through the St. Clair Tunnel near Detroit. Each locomotive was required to haul a train weighing 760 tons up the two

per cent grades at the tunnel entrances. The locomotives had side tanks and a centrally located cab, the coal bunker being at the rear end. The boiler had a long narrow firebox, with a water-tube grate having an area of 38.7 square feet. The St. Clair Tunnel was electrified in 1908.

Late in 1891 the weight record was again broken, when five Decapod (2-10-0) type locomotives were built for the Erie. These were intended for pushing service on the Susquehanna Hill, where the grade is 60 feet to the mile. They had Wootten boilers with combustion chambers, and rocking grates having an area of 89.5 square feet. There was a centrally-located cab and also a commodious shelter for the fireman at the rear end. Vauclain compound cylinders were applied.

The third record-breaker was built for the Lehigh Valley Railroad in 1898, and was intended for service on the Mountain Cut-off near Wilkes-Barre. Like the Erie locomotives, these Lehigh Valley engines had Vauclain compound cylinders; but the boilers were of the modified Wootten type with a D-head firebox. The grate area was 90 square feet. On the Mountain Cut-off each locomotive was rated to handle 1000 tons up a grade of 60 feet to the mile at a speed of 17 miles an hour.

The Brooks Locomotive Works, in 1899, built heavy anthracite burners of the Twelve-wheeled (4-8-0) type for the Central Railroad of New Jersey and also for the Lackawanna. Apart from minor details these two groups were practically alike. They had single-expansion cylinders, with piston valves, boilers of the modified Wootten type and centrally located cabs.

Excluding some switching engines, the only hard-coal burners built by the Pennsylvania up to 1899 were passenger locomotives of the 4-4-0 type. The final development of this type was seen in the D16 group, which was introduced in 1895 and was built for several years thereafter. These engines had grates ten feet long, with an area of 33.2 square feet, and were built with two sizes of driving wheels—68 and 80 inches in diameter. Since 1889 the Pennsylvania had been using Belpaire boilers on its standard passenger locomotives, and Class D16 had a boiler of that type. These locomotives were used in both hard coal and soft coal territory, and for some years worked the bulk of the fast passenger traffic east of Pittsburgh. They have now nearly all disappeared, but they were undoubtedly among the most satisfactory locomotives ever used on the road.

The first locomotives of the Atlantic (4-4-2) type to have Wootten boilers were built by the Baldwin Locomotive Works in April, 1896, to the order of the Philadelphia and Reading for service on the Atlantic City Railroad. The running time between Camden and Atlantic City, 55½ miles, was being steadily reduced, and the new engines were designed to handle a train of eight cars on this run in 60 minutes, or one of six cars in 50 minutes. It was estimated that a maximum of 1400 indicated horsepower would be required to do this work. The locomotives as built, had Vauclain compound cylinders and driving wheels 84¼ inches in diameter. The steam pressure carried was 200 pounds, and the boiler had a combustion chamber, the grate area being 76 square feet and the total heating surface 1835 square feet. Under test the locomotives developed 1450 indicated horsepower at a speed of 70 miles an hour.

The success of these locomotives led the Railroad Company, in 1897, to put on one train which was scheduled to make the run in one hour flat, including the time required to ferry the passengers from Philadelphia to Camden—an operation for which the time-table allowed eight minutes, but which invariably required more time. The train, hauled by engine 1027, ran every week-day during the months of July and August. It was composed of either five or six cars, as required, and was never once late at Atlantic City; the fastest time for the run being 46½ minutes, equivalent to an average speed, start to stop, of 71.6 miles an hour. The average time consumed was 48 minutes, equivalent to a speed of 69 miles an hour. Considering both speed and punctuality, it was an astonishing record.

The Pennsylvania watched the proceedings, and in 1898 put on a sixty-minute train which was run over the old Camden and Atlantic Railroad. The track mileage was 58.3 as against 55½ by the Reading, but the ferry at the Philadelphia end was considerably shorter, so that there was little to choose as far as running speeds were concerned. The Pennsylvania hauled their train with a 4-4-0 type locomotive of Class D16a which, although among the finest representatives of the type ever built, were handicapped through having to burn anthracite in a narrow firebox. Comparing the locomotives used by the two roads, it may be noted that while the Pennsylvania engine had the larger total heating surface and weight on drivers, it had less than half the grate area of the Reading engine. The compound cylinders of the latter may have helped a trifle, for the high-wheeled Vauclain compounds, when properly maintained, were fast runners; but the big grate was the feature that did the business. The Pennsylvania probably would have done better with bituminous coal, but they had to meet the Reading slogan of "no smoke, no cinders"—the latter item open to doubt.

In 1899 the Pennsylvania met the situation by bringing out their first wide firebox Atlantic Type locomotives—Class E1. There were three of these engines—numbers 698, 700 and 820—and it is safe to say that, at the time of their construction, they represented the most careful designing and the finest workmanship that could be found in this country. They met the 60-minute schedule without difficulty and demonstrated their ability to easily maintain an average speed of 75 miles an hour from Hammonton to Drawbridge, a distance of 27.4 miles, with trains weighing 300 tons behind the tender.

In view of the many interesting details of Class E1, including the cylinders, the valve gear and machinery, the frames and running gear, and the boiler, a complete description of this class would require a lengthy article. Our interest centers chiefly in the boiler, which may be described as a Belpaire Wootten. The firebox had a combustion chamber with a brick wall built across the back of it, in accordance with Mr. Wootten's design, but following Pennsylvania practice the Belpaire system of staying was employed. The crown and roof sheets were flat and horizontal, and the water spaces were of liberal width throughout. The grates were of the rocking type arranged to shake in four sections, and particular attention was given to the arrangement of the

ash-pan and smoke-box. All these features contributed to the success of the locomotives.

The Pennsylvania's Class E1 may be considered as representing the high-water mark in the development of the hard-coal burning locomotive. It had many fine contemporaries—such as the Black Diamond engines on the Lehigh Valley, the Baldwin and the Brooks Atlantics built for the Central Railroad of New Jersey, which were used in the New York-Philadelphia service, and the highly efficient eight-wheelers and ten-wheelers of the Lackawanna—but the rest of the story can be told in a few words. The Pennsylvania built no more hard-coal burners; on their subsequent Atlantics they narrowed the firebox sufficiently to place the cab at the rear, and used bituminous coal as fuel.

Subsequent to the opening of the present century the railroads in the anthracite region continued, on new power, to use boilers of the Wootten and modified Wootten types, enlarging the fireboxes until grate areas reached, and in some cases even exceeded 100 square feet. Such boilers were used on locomotives of many types, notably the Pacific (4-6-2) for heavy passenger service, and the Consolidation (2-8-0) and Mikado (2-8-2) for freight. Watertube grates gave way to those of the rocking pattern, or to a combination of widely spaced water tubes and rocking bars. As boiler dimensions increased it became impossible to provide room for the enginemen in a centrally-located cab, and the cab was moved to the rear. While these changes were taking place, the increasing cost of anthracite, and the difficulty in generating sufficient steam in very large locomotives when using that fuel alone, resulted in the general use of a mixture of buckwheat anthracite and bituminous coal. The necessity of using mechanical stokers on the largest locomotives encouraged the use of a high percentage of bituminous, as it has not been found practicable, in locomotive service, to burn straight anthracite with a stoker.

Many of the most recent locomotives now operating in the anthracite region were designed to burn straight bituminous coal; and even when mixtures are burned, Phoebe Snow is finding it necessary to keep off the railroads—unless she rides in air-conditioned trains. Large numbers of former hard-coal burning locomotives with boilers of both the full Wootten and modified Wootten types, are now operating on straight bituminous coal. In the interest of economy it has doubtless become necessary to do this; but the resulting effect on the atmosphere in such regions as the Schuylkill and Lehigh Valleys, and other districts which might be named, is sad to see.

The Wootten boiler, although originally designed to burn refuse anthracite, pointed the way toward the development of the high-power soft-coal burning boiler as we have it today. To meet the demand for motive power of high capacity, the soft-coal burning boiler gradually developed into one having the most prominent characteristics of the Wootten type—a wide firebox with an extremely large grate, and a combustion chamber extending forward into the boiler barrel. Therefore, although anthracite has practically passed out of the picture as a locomotive fuel, its use, in past years, was a factor of first importance in the development of the present-day super-power locomotive.

REPRESENTATIVE WIDE FIREBOX LOCOMOTIVES USING SUPERHEATED STEAM AND DESIGNED TO BURN MIXED FUEL

Road	Date	Builder	Type	Cylinders	Drivers Diam.	Steam Press. lb.	Grate Area sq.ft.	Water Heatg. Surf. sq.ft.	Ratio Water Htg. Surface to G. Area	Super-h't'g. Surface sq.ft.	Comb't'n Chamber	Weight on Drivers, lb.	W'ght, tot. engine, lb.	Tractive Force lb.
Phila. & Reading	1914	Baldwin	4-4-0	21"x24"	68½"	210	86.0	1517	17.7	257	With	120,530	173,490	27,850
Phila. & Reading	1915	R. R. Co.	4-4-2	23½"x26"	80"	215	108.0	2493	23.1	677	With	129,200	213,900	32,800
Lehigh Valley	1914	R. R. Co.	4-6-2	25"x28"	77"	215	87.0	3744	43.0	812	None	161,940	262,160	41,600
Phila. & Reading	1922	R. R. Co.	4-6-2	25"x28"	80"	220	94.5	2927	31.0	848	With	178,900	273,600	40,900
Del. & Hudson	1914	Am. Loco. Co.	4-6-2	24"x28"	69"	205	99.3	3896	39.2	796	None	191,000	293,500	40,730
Del., Lack. & West.	1915	Am. Loco. Co.	4-6-2	27"x28"	73"	200	91.3	3680	40.3	760	With	197,300	305,500	47,500
Cent. R. R. of N. J.	1923	Baldwin	4-6-2	26"x28"	79"	210	94.8	3803	40.2	812	With	196,000	306,000	42,770
Lehigh Valley	1919	Baldwin	4-6-2	27"x28"	73"	205	95.2*	4118	43.3	980	With	204,560	311,900	48,720
Lehigh & New Eng'd	1915	Baldwin	2-8-0	25"x30"	57"	180	95.0	3064	32.3	724	None	207,800	229,650	50,300
Phila. & Reading	1922	Baldwin	2-8-0	25"x32"	55½"	210	94.9*	2665	28.1	575	With	256,620	283,320	64,300
Lehigh & Hud. Riv.	1925	Baldwin	2-8-0	27"x32"	61"	220	100.0*	3607	36.1	924	None	283,800	309,700	71,500
Reading Co.	1925	Baldwin	2-8-0	27"x32"	61¼"	220	94.5*	3315	35.1	778	With	284,190	314,950	71,000
Lehigh Valley	1916	Baldwin	2-8-2	27"x30"	63"	190	100.0*	4150	41.5	980	With	232,000	325,200	56,000
Phila. & Reading	1914	Baldwin	2-8-2	24"x32"	61½"	225	108.0*	4224	39.2	993	With	246,600	329,300	54,800
Cent. R. R. of N. J.	1924	Am. Loco. Co.	2-8-2	27"x32"	63"	200	94.8*	4317	45.5	1050	With	254,500	343,500	63,000
Lehigh Valley	1919	Baldwin	2-10-2	29"x32"	63"	200	100.0*	4913	49.1	1179	With	293,560	374,100	72,600
Reading Co.	1928	R. R. Co.	2-10-2	30½"x32"	61½"	220	108.0*	5502	51.0	1840	With	353,050	439,900	90,500

——As far as can be determined, all the locomotives listed above were equipped with rocking grates, or with grates composed of rocking bars and widely-spaced water tubes.

*Stoker fired.

ANTHRACITE-BURNING LOCOMOTIVES, MISCELLANEOUS TYPES

Road	Date	Builder	Type	Cylinders	Drivers Diam.	Steam Press lb.	Firebox Type	Grate Area sq.ft.	Heatg. Surf., sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Wght. on Drivers, lb.	Wght, total Engine, lb	Tractive Force, lb.
Phila. & Reading	1896	Baldwin	4-4-2	13" 22"x26"	84¼"	200	Wide*	76.0	1835	24.2	Comb.	78,600	142,900	**14,400
Lehigh Valley	1896	Baldwin	4-4-2	19"x26" 14"	76½"	180	Wide	63.8	2217	34.8	Comb.	83,030	147,540	18,770
Cent. R. R. of N. J.	1899	Baldwin	4-4-2	24"x26"	84¼"	200	Wide*	76.0	2669	35.0	Rock.	87,860	163,500	**17,000
Pennsylvania	1899	R. R. Co.	4-4-2	20½"x26"	80"	185	Wide*	68.0	2320	34.2	Rock.	101,550	173,450	21,480
Cent. R. R. of N. J.	1901	Brooks	4-4-2	20½"x26" 15"	85"	210	Wide	82.0	2967	36.2	Rock.	99,400	191,000	22,950
Erie	1902	Baldwin	4-4-2	25"x28"	76"	200	Wide	76.2	2934	38.5	Rock.	79,550	186,290	**22,600
Phila. & Reading	1903	Baldwin	4-4-2	21"x24"	84¼"	225	Wide	80.0	3048	38.1	Rock.	94,300	178,600	24,000
Phila. & Reading	1906	R. R. Co.	4-4-2	21"x27"	86"	230	Wide*	94.0	3270	34.8	Rock.	125,900	223,200	27,100
Lehigh Valley	1910	Baldwin	4-4-2	20"x26"	77"	200	Wide	76.9	2883	37.5	Rock.	97,000	187,200	22,960
Del., Lack & West.	1876	Baldwin	2-6-0	18"x24"	56¾"	130	Narrow	25.9	1286	49.7	W. T.	70,000	82,000	15,200
Erie	1886	Baldwin	2-6-0	20"x24"	68"	130	Wide*	76.0	1458	19.2	Comb.	93,390	113,380	15,630
Del., Lack. & West.	1887	R. R. Co.	2-6-0	19"x24"	57¾"	140	Wide	72.0	1409	19.5	Comb.	100,000	115,000	17,900
Del. Susq. & S'K'L.	1894	Baldwin	2-6-0	22"x28"	62"	160	Narrow	38.0	2084	55.0	Rock.	136,100	152,000	29,700
Erie & Wyom'g Val.	1894	Baldwin	2-6-0(3)	17"x24"	57"	150	Wide*	76.0	1600	21.1	Comb.	104,000	120,000	23,300
Lehigh Valley	1880	R. R. Co.	4-8-0	20"x26"	48"	125	Narrow	32.0	1174	36.7	W. T.	82,430	101,700	23,000
Del., Lack. & West.	1899	Brooks	4-8-0	21"x32"	54"	200	Wide	82.4	3168	38.5	W. T.	166,000	205,000	44,500
Lehigh Valley	1902	Baldwin	2-6-2	22"x26"	76½"	210	Wide	87.7	3670	41.8	Rock.	135,000	200,000	29,400
Lehigh Valley	1906	Baldwin	4-6-2	22"x28"	76½"	210	Wide	80.0	3853	48.1	Rock.	153,740	241,360	31,700
St. Clair Tunnel	1891	Baldwin	0-10-0 tank	22"x28" 16"	50"	160	Narrow	38.7	2412	62.3	W. T.	186,800	186,800	37,000
Erie	1891	Baldwin	2-10-0	27"x28"	50"	180	Wide*	89.5	2443	27.3	Rock.	172,000	195,000	**35,000

*With combustion chamber.
**Working compound.

ANTHRACITE-BURNING LOCOMOTIVES, 2-8-0 TYPE

Narrow Firebox

Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb't'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Lehigh Valley	1876	Baldwin	20″x24″	50⅜″	130	27.6	1281	46.5	W. T.	None	87,700	102,820	21,100
Lehigh Valley	1880	Baldwin	20″x24″	50″	130	35.2	1267	36.0	W. T.	None	92,540	103,840	21,250
Phila. & Reading	1888	Baldwin	22″x28″	50″	140	38.7	2345	60.6	Comb.	None	138,240	152,940	32,300

Wide Firebox

Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb't'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Phila. & Reading	1880	Baldwin	20″x24″	50″	120	76.0	1357	17.9	Comb.	With	90,300	104,100	19,600
Lehigh Valley	1888	Baldwin	20″x24″	50⅜″	130	63.0	1681	26.7	Comb.	None	106,200	119,900	21,000
Cent. R. R. of N. J.	1888	Baldwin	22″x28″	50″	130	76.0	1941	25.5	W. T.	With	125,300	141,300	30,000
Cent. R. R. of N. J.	1889	Cooke	20″x24″	49¾″	140	63.0	1954	31.0		With	118,300	136,300	23,000
Erie	1890	Baldwin	20″x24″	50″	160	77.0	1399	18.2	Rock.	With	114,100	128,940	26,100
Lehigh Valley	1892	Baldwin	22″x28″	50⅜″	140	76.0	2405	31.7	Comb.	None	127,500	145,900	32,000
Cent. R. R. of N. J.	1896	Baldwin	22″x28″	56″	180	76.0	2332	30.7	Comb.	None	138,650	155,700	37,200
Long Island	1898	Brooks	21″x28″ 18″	51″	180	69.5	1945	28.0		None	135,000	155,000	37,200
Lehigh Valley	1898	Baldwin	30″x30″	55″	200	90.0	4106	45.6	W. T.*	None	202,230	225,100	**48,000
Del. & Hudson	1899	Schenectady	21″x26″	56″	180	90.0	2564	28.5	Comb.	None	133,000	153,000	31,300
Del., Lack. & West.	1901	Am. Loco. Co.	21″x26″	57″	200	95.0	2773	29.2	Rock.	None	166,000	186,000	34,200
Del. & Hudson	1904	Am. Loco. Co.	21″x30″	57″	190	90.0	3408	37.8	Comb.	None	170,000	193,000	37,500
Phila. & Reading	1905	Baldwin	22″x30″	61½″	210	90.0	3209	35.6	Rock.	With	204,000	226,250	42,200
Del. & Hudson	1906	Am. Loco. Co.	23″x30″	57″	210	99.8	4045	40.5			217,500	246,500	49,690

Locomotives similar in dimensions and weight to the Lehigh Valley design of 1876, were built in that year by the Baldwin Locomotive Works for the Delaware, Lackawanna & Western, and in 1880 for the Central R. R. of New Jersey.

Grates, Style
W. T.—Water Tube.
Rock.—Rocking.
Comb.—Water tube and cast iron bars.

*On first engine only; subsequent engines of same class had rocking grates.
**Working compound.

ANTHRACITE-BURNING LOCOMOTIVES, 4-6-0 TYPE

Narrow Firebox

Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Cent. R. R. of N. J.	1873	Baldwin	18"x22"	56"	130	23.4	1183	50.6	W. T.	None	63,000	80,000	14,100
Phila. & Reading	1876	R. R. Co.	18"x24"	54"	120	28.0	1127	40.3	W. T.	None	53,540	76,730	14,700
Cent. R. R. of N. J.	1881	Baldwin	18"x22"	56"	130	25.5	1241	48.2	W. T.	None	70,000	85,000	14,100
Lehigh Valley	1887	Baldwin	20"x24"	54"	130	38.5	1904	49.5	W. T.	None	90,000	110,000	19,700
Lehigh Valley	1889	Baldwin	19"x24"	55.3"	130	28.6	1574	55.1	W. T.	None	86,100	106,170	17,350
Erie	1893	Baldwin	20"x24"	68"	160	39.6	2024	51.0	Rock.	None	109,040	137,540	19,200

Wide Firebox

Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Phila. & Reading	1877	R. R. Co.	18"x24"	54"	120	64.0	982	15.4	Comb.	With	67,900	86,150	14,700
Phila. & Reading	1890	Baldwin	20"x24"	60⅝"	150	76.0	1685	22.2	Comb.	With	94,900	121,900	20,300
Lehigh Valley	1891	Baldwin	19"x24"	55.3"	130	63.0	1715	27.3	Rock.	None	91,220	115,220	17,300
Erie	1891	Baldwin	21"x26"	62"	160	77.0	1673	21.7	Rock.	With	105,850	133,950	25,200
Cent. R. R. of N. J.	1892	Rogers	21"x26"	63"	150	76.2	2062	27.1		None	125,400	158,000	23,200
D. L. & W.	1892	R. R. Co.	20"x24"	62"	160	83.3	2082	25.0	W. T.	None	110,000	137,000	21,100
Lehigh Valley	1898	Baldwin	20"x24"	68"	180	76.3	2109	27.7	Comb.	None	118,500	147,050	21,600
Long Island	1899	Brooks	21"x26" 14"	60½"	180	69.5	2030	29.2		None	115,000	151,000	29,000
Phila. & Reading	1899	Baldwin	24"x26"	60⅝"	200	76.0	1997	26.3	Comb.	With	112,000	153,000	*22,800
Cent. R. R. of N. J.	1900	Brooks	20"x28" 17"	69"	210	83.3	2512	30.2		None	134,000	177,000	28,980
Lehigh Valley	1901	Baldwin	28"x26"	72"	200	71.2	2708	38.0	Rock.	None	138,350	191,760	*28,000
Erie	1901	Baldwin	21"x26"	64"	200	77.4	2314	29.9	Rock.	None	137,700	170,560	30,500
Lehigh Valley	1904	Baldwin	21"x28"	69"	205	85.0	3282	38.6	Rock.	None	155,230	199,330	31,180
D. L. & W.	1905	Am. Loco. Co.	21½"x26"	69"	215	94.8	3378	35.6	Rock.	None	154,000	201,000	31,800
Phila. & Reading	1905	Baldwin	22"x28"	68½"	210	90.4	2961	32.8	Rock.	With	165,700	214,000	35,400

Grates, Style
W. T.—Water Tube.
Rock.—Rocking.
Comb.—Water tube and cast iron bars.

*Working compound.

ANTHRACITE-BURNING LOCOMOTIVES, 4-4-0 TYPE

Narrow Firebox

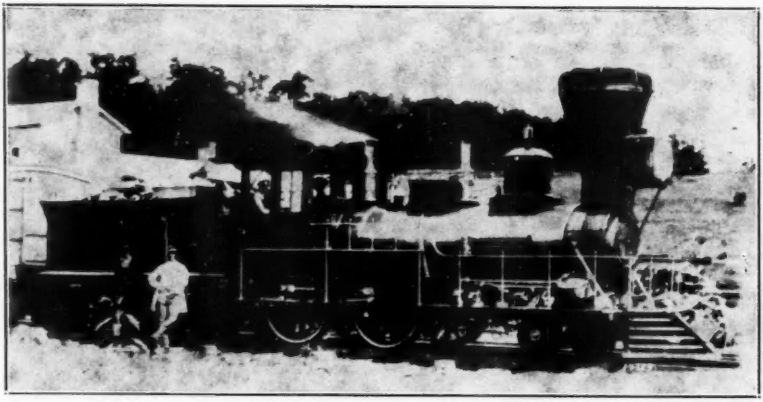
Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb't'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Pennsylvania	1873	R. R. Co.	17″x24″	62″	125	28.7	1158	40.2	W. T.	None	56,200	81,800	11,890
Phila. & Reading	1874	R. R. Co.	17″x22″	68″	120	25.2	1014	40.2	W. T.	None	45,500	75,000	9,550
Cent. R. R. of N. J.	1875	Baldwin	18″x22″	67″	130	25.7	1120	43.5	W. T.	None	55,000	80,000	11,800
Del. Lack. & West.	1876	Baldwin	18″x24″	67⅜″	130	25.6	1122	43.8	W. T.	None	52,000	78,000	12,780
Cent. R. R. of N. J.	1881	Baldwin	19″x24″	68″	130	38.2	1340	35.1	W. T.	None	66,850	93,000	14,100
Pennsylvania	1881	R. R. Co.	18″x24″	78″	140	34.7	1230	35.5	W. T.	None	64,900	96,700	11,860
Lehigh Valley	1882	R. R. Co.	19″x24″	68½″	140*	36.8	1321	36.0	W. T.	None	67,870	90,390	*15,100
Pennsylvania	1883	R. R. Co.	18½″x24″	68″	140	34.7	1530	44.0	W. T.	None	67,800	100,600	14,370
Phila. & Reading	1888	Baldwin	19½″x24″	67½″	160	37.6	1805	48.0	Comb.	None	85,000	115,000	18,400
Cent. R. R. of N. J.	1890	Baldwin	19″x24″	68″	130	37.0	1520	41.0	W. T.	None	73,300	103,100	14,100
Long Island	1893	Baldwin	18″x24″	67″	180	38.5	1516	39.4	W. T.	None	72,860	103,060	17,800
Cent. R. R. of N. J.	1893	Baldwin	20″x24″	78″	180	38.5	1696	44.0	W. T.	None	87,300	124,900	18,800
Pennsylvania	1895	R. R. Co.	18½″x26″	80″	185	33.2	1905	57.3	Rock.	None	93,100	134,500	17,490
Del. & Hudson	1896	Schenectady	19″x24″	68½″	180	37.2	1859	50.0		None	87,000	126,700	19,400

Wide Firebox

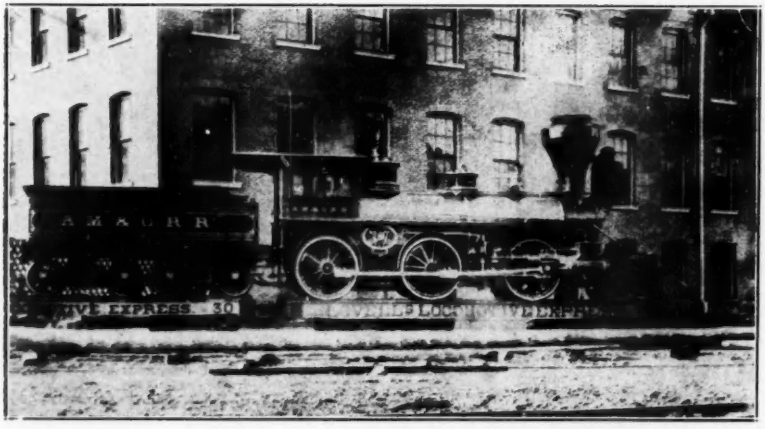
Road	Date	Builder	Cylinders	Drivers diam.	Steam Press. lb.	Grate Area, sq.ft	Heatg. Surf. sq.ft.	Ratio Htg. Surf. to G. Area	Grate Style	Comb't'n Chamber	Weight on Drivers, lb.	Wt. Total Engine, lb.	Tractive Force, lb.
Phila. & Reading	1880	R. R. Co.	21″x22″	68″	140	76.0	1117	14.7	Comb.	With	64,250	96,200	17,000
Phila. & Reading	1889	Baldwin	21″x22″	68½″	160	76.0	1325	17.4	Comb.	With	69,500	105,500	19,300
Lehigh Valley	1895	Baldwin	20″x24″	69″	160	67.7	1890	27.9	Comb.	None	96,640	138,100	18,920
Del., Lack. & West	1896	Dickson	19½″x24″	68″	160	80.0	1720	21.5	W. T.	None	79,500	117,000	18,300
Del., Lack. & West.	1901	Am. Loco. Co.	20″x26″	69″	185	87.6	2143	24.4	Rock.	None	93,000	139,000	23,700
Phila. & Reading	1901	Baldwin	21″x22″	68½″	200	76.0	1942	25.6	Comb.	None	87,680	132,680	24,100
Del. & Hudson	1903	Am. Loco. Co.	20″x24″	69″	190	79.8	2261	28.4			94,000	146,000	22,500
Cent. R. R. of N. J.	1905	Am. Loco. Co.	19″x26″	69″	200	81.6	2006	24.5	Rock.	None	108,000	158,000	23,120

Grates, Style
W. T.—Water Tube.
Rock.—Rocking.
Comb.—Water tube and cast iron bars.

*Estimated; no record.
**Similar locomotives with Vauclain compound cylinders, 13″ and 22″x24″, built by Baldwin for C. R. R. of N. J., 1891-93.



V. & T. "Roanoke." Anderson, 1854.



—Courtesy of C. E. Fisher.

A. M. & O. No. 80. Mason, 1873. The only moguls ever built by Mr. Mason went to this road.

The Norfolk and Western Railway

By H. E. Nichols

The history of the Norfolk & Western Railway begins in the early days of railroading, with the building of a railroad nine miles long between the cities of Petersburg and City Point, Virginia. Although the incorporation of a company to build this line had been sought as early as 1833, it was not until January 26, 1836 that the General Assembly passed the act chartering THE CITY POINT RAILROAD COMPANY. Construction of the line was commenced in April 1837, and it was opened for operation on September 7, 1838. A description of the type of track, as found in one of the annual reports, follows:

"The superstructure is of the ordinary plate rail kind, consisting of cross sills 5 ft. apart, about 12 inches square and 7 ft. long, with notches, into which are fixed, by wedges, wooden sleepers 5x9 inches, capped with flat iron ½ inch thick and 2 inches wide."

The first locomotive used on the road was named the "Powhatan", and was a 6-wheel engine built by William Norris in 1838 and costing approximately $6,600.00.

On July 17, 1847 the City of Petersburg purchased the City Point Railroad, by which it was operated under the name of the Appomattox Railroad until acquired by the South Side Railroad, now that portion of the Norfolk & Western extending between Petersburg and Lynchburg, on May 1, 1854.

THE SOUTH SIDE RAILROAD COMPANY, extending from Petersburg to Lynchburg, Virginia, a distance of 123 miles, was authorized by the Virginia General Assembly on March 5, 1846. The company was organized on August 8, 1849 and construction work started in December, 1849. The road was opened for operation from Petersburg to Burkeville in March, 1852, and completed to Lynchburg on November 2, 1854. As previously stated, the South Side Railroad took over the Appomattox Railroad on May 1, 1854.

THE VIRGINIA AND TENNESSEE RAILROAD COMPANY, extending from Lynchburg to Bristol, Virginia, a distance of 204 miles, was incorporated on March 24, 1848 as the Lynchburg & Tennessee Railroad, the name being changed to the "Virginia & Tennessee" by an act of the General Assembly on March 6, 1849. Construction was commenced the same year, and the road formally opened to Liberty (now Bedford) on April 1, 1852; to Big Lick (now Roanoke) on November 1, 1852, and completed and opened to Bristol on October 1, 1856, it having crossed both the Blue Ridge and the Allegheny mountains, which was looked upon as a great engineering feat.

THE NORFOLK AND PETERSBURG RAILROAD COMPANY, extending between those cities, a distance of 80 miles, was authorized by the Virginia Assembly on March 17, 1851. Construction was commenced in May, 1853, with Mr. William Mahone as Chief Engineer, a man who was later to play an important part in the progress and development of the several roads which were destined to be the nucleus of the present

Norfolk & Western system. The line was completed and in operation on September 1, 1858. The locomotives of this road never bore any names, only numbers.

William Mahone, referred to above as Chief Engineer of the Norfolk & Petersburg Railroad, became the President of that road on April 12, 1860. At the outbreak of the Civil War, he entered the Confederate Army as a Lieutenant Colonel of Volunteers, and distinguished himself in the service so that he was finally promoted to the rank of Major General in August, 1864. After the war ended, he resumed his position as head of the Norfolk & Petersburg Railroad and started work rebuilding the road, which had suffered heavily from the ravages of war, and began to actively consider the idea he had cherished in his mind for several years—the consolidation of the above three roads under one management. On December 7, 1865 he was elected President of the South Side Railroad, which was a step toward the accomplishment of his aim, but considerable opposition was met with on the part of the stockholders of the Virginia & Tennessee, and it was not until October 10, 1867 that he was elected President of the Virginia & Tennessee Railroad. The next step was to secure the approval of the General Assembly, which was obtained in an act passed on April 18, 1867, but the restrictions imposed with regard to certain financial arrangements were so severe that they could not be completed within the time specified, and the act therefore became inoperative. After a hard legislative fight, General Mahone finally achieved his objective on June 17, 1870 by the approval of the Governor of an act authorizing the consolidation, and the result was the organization of THE ATLANTIC, MISSISSIPPI AND OHIO RAILROAD COMPANY on November 12, 1870. The money required to purchase the stock of the old companies was secured by the sale of bonds to British financial interests through the efforts of General Mahone.

The prospects for the future of this road looked very bright until the panic of 1873, with the inevitable result that on June 6, 1876 the property went into the hands of receivers, by whom it was operated until a foreclosure sale on February 9, 1881, at which time the property was purchased by Clarence H. Clark and his associates, which was confirmed by the Court on April 4, 1881, and the new company, styled THE NORFOLK AND WESTERN RAILROAD COMPANY, was officially organized on May 4, 1881.

After fourteen years of operation of the new company it was again forced into the hands of receivers on February 6, 1895 by another business depression, the outcome of which was the organization of THE NORFOLK AND WESTERN RAILWAY COMPANY on September 24, 1896, since which time the operation of the company has been a most successful one.

The mileage of the Norfolk & Western Railway has increased greatly during the past fifty years, until it now comprises a system of 2,173 miles, due to extensions built, the most important of which were the New River Extension, 75 miles, completed in 1883, the Ohio Extension, 191 miles, to Kenova, W. Va., completed in 1892, including a bridge over the Ohio River at that point, and the Clinch Valley Extension, 100 miles,

completed in 1891; by the construction of numerous branch lines throughout the coal fields which it serves, and by the acquisition of the following railroads:—

The Shenandoah Valley Railroad, 254 miles, from Hagerstown, Md. to Roanoke, Va, completed June, 1882, in hands of receivers March 31, 1885 and purchased October 1, 1890;

The Scioto Valley Railroad, originally the Portsmouth, Columbus & Michigan, constructed from 1875 to 1881, in receivers' hands May 29, 1885, and purchased Feb. 1, 1890;

The Lynchburg & Durham Railroad, organized in 1887 as a consolidation of three companies who did no work, completed September 12, 1890, leased to the N&W April 28, 1893, and purchased Oct. 6, 1896;

The Roanoke & Southern Railroad, completed in 1892, leased to the N&W March 1, 1892, and purchased in 1896;

The Cincinnati, Portsmouth & Virginia Railroad, incorporated January 11, 1876 as the Cincinnati, Batavia & Williamsburg R. R., soon changed to the Cincinnati & Eastern Railway, later the Ohio & Northwestern Railroad; the road, which was 3-ft. gauge, was changed to standard in 1888 and the line sold to the CP&V in 1891, and to the N&W in 1901;

The Virginia Carolina Railway, purchased August 27, 1919;

The New River & Holston Railway, purchased May 28, 1919;

The Columbus & Maysville Railroad, completed in 1880, and purchased about the same time as the CP&V.

In listing the acquired lines, no attempt has been made to include companies organized, constructed and operated by the N&W under individual names, as none of them had any standard gauge locomotives of their own.

The Norfolk & Western was originally built to 5 ft. gauge, and the change to standard gauge was made on the entire main line in one day, June 1, 1886. Previously a car hoist located at Lynchburg had been provided in 1875 to facilitate interchange of cars with other roads. This car hoist was used to lift the body of the car from its trucks, and when so lifted its trucks were rolled away and those of the required gauge placed under the car.

Incidentally, it may be mentioned that the Roanoke Shops of the Norfolk & Western, was once an individual locomotive and car manufacturing concern, known as the Roanoke Machine Works, and located at Roanoke, Virginia. The grounds comprised 60 acres, on which were erected the various buildings for the manufacture of cars and locomotives. Commenced in 1882, and completed in 1883, with a capacity of ten cars per day, and one to two locomotives per month, it commenced building cars immediately, and turning out locomotives the following year. The first engine built was Norfolk & Western No. 117, a consolidation freight locomotive with 20x24″ cylinders, 50″ drivers, and a weight of 109,300 lbs., which was completed in September, 1884. Thereafter the Roanoke Machine Works built engines exclusively for the Norfolk & Western, although it built freight cars for the Shenandoah Valley and other roads. In all, 152 locomotives were built by the Roanoke Machine Works until its acquisition by the N&W in 1897, upon which it became the Roanoke

Shops of that road. Its locomotive building did not cease, however, for some 140 engines have been built by the Roanoke Shops since 1897, including the heaviest types of motive power in use on the N&W, in addition to which thousands of freight cars have been built.

Appended are rosters of the locomotives of the predecessor roads of the Norfolk & Western Railroad up to the time of its organization in 1881. An interesting fact to note in connection with the AM&O locomotives is that after the consolidation of the Norfolk & Petersburg, the South Side, and the Virginia & Tennessee, the locomotives of these roads retained their former road number designations during the time they were operated under the name of the AM&O, notwithstanding the AM&O had numerous locomotives lettered AM&O, and it is possible that during that time some of the engines of the individual roads bore the AM&O lettering, and some of the engines of the AM&O bore the lettering of the individual roads.

CITY POINT R. R. & APPOMATOX R. R.

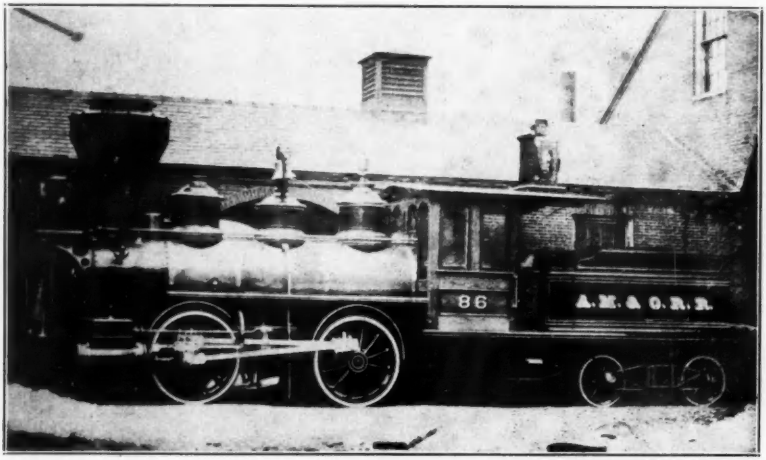
Powhatan	Norris	1838	9x16"	48"	8 tons
Pocahontas	Norris	1838	9x16"	48"	8 tons
City of Petersburg	Baldwin #492	1852	13x18	4-54"	12 tons

NORFOLK & PETERSBURG R. R.

1	R. Norris	1857	12x24"	4-66"	46000
2	R. Norris	1857	12x24	4-66	46000
3	Baldwin #824	1858	14x24	4-54	49000
4	Baldwin #825	1858	14x24	4-54	49000
5	R. Norris	1857	14x24	4-54	56000
6	Mason	1865	16x24	4-60	58920 Date pur.
7	Hinkley #740	1867	16x24	4-60	60180 Form.SS #3
8	Mason #311	1869	16x24	4-60	61000
9	Mason #312	1869	16x24	4-60	61000
10	Norris	1868	16x22	4-60	56500 Ch. to SS #10
10	Mason #350	1870	16x24	4-60	61000
11	Norris	1868			
11	Mason #385	1871	15x22	4-60	60100
12	Norris	1868	16x22	4-54	56700 Tfrd to V&T
13	Norris	1868	16x22	4-54	56500 Tfrd to V&T
14	Mason #313	1869	16x24	4-62	62800 Tfrd to V&T
15	Mason #315	1869	16x24	4-56	60800 Tfrd to V&T
16	Mason #316	1869	16x24	4-56	60200 Tfrd to V&T
17	Mason #324	1869	16x24	4-56	60500 Tfrd to V&T
18	Mason #329	1869	16x24	4-56	59300 Tfrd to V&T
19	Mason #330	1869	16x24	4-56	61000 Tfrd to V&T
20	Mason #343	1870	16x24	4-56	60500 Tfrd to V&T
21	Mason #344	1870	16x24	4-56	61300 Tfrd to V&T
22	Mason #346	1870	16x24	4-56	60500 Tfrd to V&T
23	Mason #347	1870	16x24	4-56	61000 Tfrd to V&T
24	Mason #349	1870	16x24	4-56	60800 Tfrd to V&T

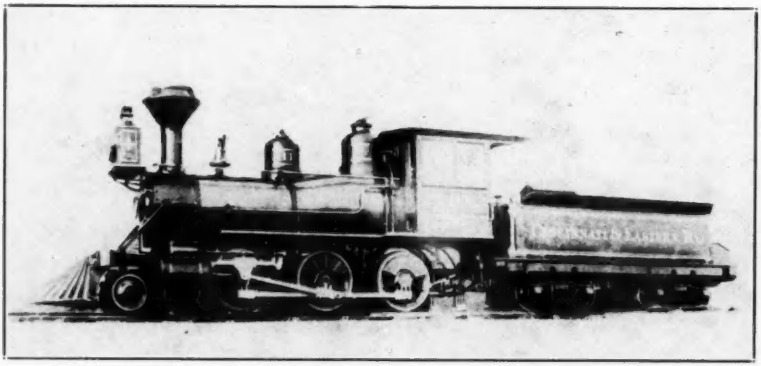
SOUTH SIDE R. R.

1-11	Appomattox	U. Wells	1852	12x18	4-56	39400
1	.....	Hinkley #738	1867	16x24	4-60	66500
2-5	Amherst	Anderson	1854	16x24	4-54	54200
2	.....	Hinkley #739	1867	16x24	4-60	66500



—Courtesy of C. E. Fisher.

A. M. & O. No. 86. Mason, 1873.



—Courtesy of C. E. Fisher.

C. & E. No. 11. Rome, 1886.

3-10	Buckingham	Souther	1854	14½x20	4-56	46150	
3	.....	Hinkley #740	1867	16x24	4-60	66500	Ch.to N&P #7
3	.....	Mason #386	1871	15x22	4-60	60100	
4	Campbell	U. Wells	1853	13½x22	4-60	46330	
5	Cumberland	New Castle	1854	15x22	4-60	46150	
6-13	Farmville	U. Wells	1851	12x18	4-54	39400	
7	Nottoway	Baldwin #495	1852	13½x22	4-60	43100	
7	.....	Mason #301	1869	16x24	4-60	65500	
8-15	Petersburg	Baldwin #463	1852	13½x22	4-60	43100	Chg. to Miss.
8-21	?	U. Wells	1858	13½x24	4-66	50000	
	Pr. Edward	U. Wells	1854	13½x24	4-54		
9	Pr. Edward	Baldwin #636	1855	13½x22	4-60	46700	
10	Pr. George	U. Wells	1854	13½x24	4-54	48340	
10-20	.....	Norris	1868	16x22	4-60	56500	Form.N&P #10
11	Sam Patch	U. Wells	1854	13½x24		48340	
12-6	Tennessee	Baldwin #637	1855	16x22	4-54	54000	
13-7-4-19	Virginia	Anderson	1854	16x24	4-54	54200	
13	.....	Mason #302	1869	16x24	4-60	66500	
14	City of P't'bg.	Baldwin #492	1852	12x18	4-54	35850	Fr. C.Pt.R.R.
14	.....	Norris	1868	16x22	4-60	63800	Form.V&T #13
15-14	Mountaineer	U. Wells	1856	14x24	4-62	51860	
15	.....	Mason #355	1870	16x24	4-60	59800	
16-9	Memphis	Norris	1857	13x22	4-48	52600	
16	.....	Mason #307	1869	16x20	4-60	59800	
17	Knoxville	Norris	1857	13x22	4-60	52200	
17	.....	Mason #308	1869	16x24	4-60	60300	
18-12	Norfolk	Baldwin #805	1858	13x24	4-60	46250	
18	.....	Mason #356	1870	16x24	4-60	61850	
?	Lynchburg	U. Wells	1851	12x18	4-50	39400	
?	Nashville	U. Wells	1860	13½x24	4-54	48300	

VIRGINIA & TENNESSEE R. R.

	Abingdon	Anderson	1852	12x18	4-54	30620	
1	Tracklayer	Souther	1854	13x20	4-48	30600	
1	Memphis	Baldwin #780	1857	17x22	6-51	53300	
1	R. L. Owen	Grant	1867	16x24	4-60	56900	
2	Virginia	Souther	1852	14x20	4-54	47700	
2	.....	Norris	1866	16x24	4-54	57800	Form. #170
3	Richmond	Anderson	1852	15x20	4-54	44900	
3	John Early	Grant	1867	16x24	4-60	56900	
4	Norfolk	Anderson	1853	15x20	4-60	46000	
5	Petersburg	Anderson	1853	15x20	4-60	46700	
5	A. C. Cum'ngs	Grant	1867	16x24	4-54	58350	
6	Phoenix	Anderson	1853	12x18	4-54	42500	
6	E. H. Gill	New Jersey	1860	16x24	4-60	53900	
7	Antelope	Anderson	1853	13x20	4-60	44000	
7	F.B.Deane, Jr.	Grant	1867	16x24	4-54	58350	
8	Henry Davis	Anderson	1853	16x24	4-54	48500	
8	Dav. Graham	Baldwin	1866	16x24	4-60	58000	
9	Antaeus	Anderson	1853	16x24	4-54	47500	Changed to
9	O. G. Clay						
9	R. W. Hughes	Norris	1866	16x24	4-54	57200	
10	Pks. of Otter	Anderson	1853	16x24	4-54	46800	
10	C. H. Lynch	Norris	1866	16x24	4-54	56730	
11	Tennessee	Anderson	1853	15x22	4-54	46000	
	Rebuilt by	V&T RR.	1860	16x24	4-56	46700	
12	Roanoke	Anderson	1854	16x22	4-54	43300	
12	.....	Norris	1868	16x24	4-54	57200	Form.N&P #12
13	Hercules	New Castle	1854	17x24	4-54	44100	

13	.....	Norris	1868	16x22	4-54	56800	Form.N&P #13
14	Reindeer	Hinkley #511	1854	15x22	4-60	46600	
14	.....	Mason #313	1869	16x24	4-62	62800	Form.N&P #14
15	Montgomery	Denmead	1854	18x22	6-48	50800	
15	.....	Mason #315	1869	16x24	4-56	60800	Form.N&P #15
16	Pulaski	Denmead	1854	15x20	4-60	42100	
16	.....	Mason #316	1869	16x24	4-56	60200	Form.N&P #16
17	Marion	Denmead	1854	18x20	6-48	56000	
17	.....	Mason #324	1869	16x24	4-56	60500	Form.N&P #17
18	Wythe	Denmead	1854	18x20	6-54	57100	
18	R. L. Owen	Baldwin	1863	18½x22	6-54	56500	
18	.....	Mason #329	1869	16x24	4-56	59300	Form.N&P #18
19	Fincastle	Denmead	1855	13½x24	4-54	41000	
19	.....	Mason #330	1869	16x24	4-56	61000	Form.N&P #19
20	Washington	Norris	1855	16x24	4-66	55650	
20	.....	Mason #343	1870	16x24	4-56	60500	Form.N&P #20
21	J. R. M'Dan'l	Norris	1856	16x24	4-66	58900	
21	.....	Mason #344	1870	16x24	4-56	61300	Form.N&P #21
22	J. M. Preston	Norris	1856	16x24	4-54	55100	
22	.....	Mason #346	1870	16x24	4-56	60500	Form.N&P #22
23	Bristol	Norris	1856	16x24	4-54	56700	
23	.....	Mason #347	1870	16x24	4-56	61000	Form.N&P #23
24	Knoxville	Norris	1857	16x24	6-48	62900	
24	.....	Mason #349	1870	16x24	4-56	60800	Form.N&P #24
25	St. Nazaire	Norris	1858	16x24	4-60	56000	
26	Chesapeake	Norris	1858	16x24	4-60	56250	
27	El Paso	Norris	1858	16x24	6-48	59480	
28	S. Francisco	Norris	1858	16x24	6-48	60200	
29	New Orleans	Rogers	1858	16x22	6-51	59500	
30	Tehauntepec	Rogers	1859	16x22	4-62	58180	
31	Gazelle	New Jersey	1858	16x22	4-63	53350	
32	Bedford	New Jersey	1859	16x22	4-60	53900	
33	Mazeppa	New Jersey	1859	15x22	4-60	51620	
34	A. V. Brown	New Jersey	1859	16x24	4-60	56720	
35	Lynchburg	New Jersey	1859	16x24	4-60	56900	
36	Chattanoogah	New Jersey	1859	17x24	4-54	58100	
36	.....	Hinkley	1854	15x22	4-60	46000	Form. #14
37	Arkansas	New Jersey	1859	17x24	4-54	58100	
38	Holston	New Jersey	1859	17x24	4-54	58350	
38-40	.....	Norris	1859	17x24	4-54	58350	
39	Mobile	New Jersey	1859	17x24	4-60	58260	
39-41	.....	Norris	1859	16x24	4-60	58260	
42	.....	Norris	1857	16x24	6-48	62000	Form. #24

ATLANTIC, MISSISSIPPI & OHIO R. R.

25	Hinkley #740	1867	4-4-0	16x24	60	60180	Form.N&P #7
27	Baldwin #5324	1880	4-4-0	18x24	62	79100	
28	Baldwin	1878	4-4-0	18x24	62	75800	
32	Baldwin #5532	1881	4-4-0	18x24	62	79400	
33	S. S. Shops	1878	4-4-0	15x22	60	50100	
34	Baldwin #4443	1878	4-4-0	18x24	62	70650	
36	Baldwin #4444	1878	4-4-0	18x24	62	68200	
62	Mason #388	1871	4-4-0	16x24	54	61900	
63	Mason #389	1871	4-4-0	16x24	54	61200	
64	Mason #390	1871	4-4-0	16x24	54	61500	
65	Mason #391	1871	4-4-0	16x24	54	61500	
66	Mason #392	1871	4-4-0	16x24	54	62000	
67	Mason #393	1871	4-4-0	16x24	54	61900	
68	Mason #394	1871	4-4-0	16x24	54	62000	

69	Mason #395	1871	4-4-0	16x24	54	61500
70	Mason #416	1871	4-4-0	16x24	60	64200
71	Mason #417	1871	4-4-0	16x24	60	63000
72	Mason #418	1871	4-4-0	16x24	60	64300
73	Mason #422	1871	4-4-0	16x24	54	62200
74	Mason #423	1871	4-4-0	16x24	54	62200
75	Mason #426	1871	4-4-0	16x24	54	62000
76	Mason #427	1871	4-4-0	16x24	54	62300
77	Mason #428	1871	4-4-0	16x24	54	61900
78	Mason #407	1871	4-4-0	15x22	60	60100
79	S. S. Shops	1872	4-4-0	15x23	60	60100
80	Mason #483	1873	2-6-0	17x24	54	66500
81	Mason #484	1873	2-6-0	17x24	54	68000
82	Mason #485	1873	2-6-0	17x24	54	72000
83	Mason #486	1873	2-6-0	17x24	54	72000
84	Mason #488	1873	2-6-0	17x24	54	72000
85	Mason #481	1873	0-4-4	14x22	48	78300
86	Mason #482	1873	0-4-4	14x22	48	78300
87	Mason #519	1873	4-4-0	16x24	54	65200
88	Mason #521	1873	4-4-0	16x24	54	65000
89	Mason #522	1873	4-4-0	16x24	54	64800
90	Mason #523	1873	4-4-0	16x24	54	65000
91	Mason #524	1873	4-4-0	16x24	54	64800

The West Point Foundry

By Chas. E. Fisher

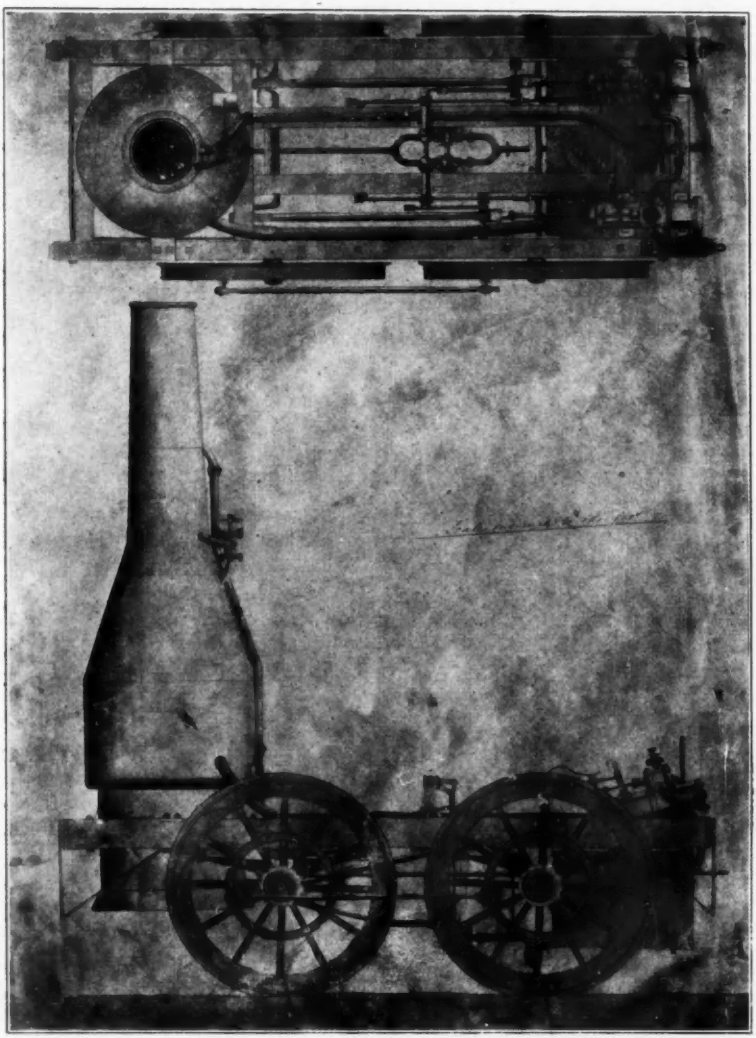
West Point Foundry, founded over a century ago, holds much of historic interest. Here were built the first steam engines in this country for practical use and it was from this foundry that came the castings for the Erie Canal, the water pipes for the Croton acqueduct and for the cities of New York, Boston and Chicago. To have served an apprenticeship in the West Point Foundry was sufficient recommendation to obtain employment in any industry of a like character.

Gouverneur Kemble was born in the little town of New York in 1786. His grandfather, Peter Kemble, was a highly successful merchant and one of the three largest landholders in New Jersey and a member of the Royal Council. He married Gertrude Bayard, grandniece of Peter Stuyvesant and kinswoman of the Van Cortlands and Stuyvesants. The second Peter, who was engaged in the East India trade had done equally well by marrying Gertrude Gouverneur, so that their son, Gouverneur Kemble was related to many of the most influential families in New York.

Young Gouverneur graduated from Columbia University and it was his good fortune to inherit his mother's family home Mount Pleasant on the Passaic River, near Newark. Here George Washington stopped during the Revolution and here young Gouverneur brought the famous novelist—Washington Irving. Here was written the famous "Salmagundi Papers"—1807 and 1808, delightful fiction of the Gouverneur family.

In 1811, at the age of twenty-five, Gouverneur Kemble went to Seville, Spain, as the representative of the New York firm of Leroy & Bayard. Here he acquired his taste for fine art and later, his house at Cold Spring was to house a collection of paintings second to none in this country. In the Barbary War, 1814, he accompanied the fleet of Commodore Decatur as assistant naval agent with headquarters at Cadiz. This brought him in contact with the Spanish method of the manufacture of cannon, then at its best. His position made him realize how this country with only its two foundries, one at Havre de Grace, the other at Georgetown, had been handicapped in the War of 1812. These matters were of such concern to President Madison and his cabinet that our Government decided to establish four foundries at strategic points in the North, South, East and West. It was probably at the suggestion of J. K. Paulding, Secretary of the Board of Naval Commissioners that the New York foundry was offered to Gouverneur Kemble, barely thirty years of age at the time but it marks the respect of his judgment and the esteem of his family.

Admiral Rogers, acting for the Board of Naval Commissioners, signed an agreement with the partners in 1816 for the delivery of a certain amount of ordnance. It was understood that the foundry was to be situated above West Point so as to receive protection from it in case any enemy invaded the Hudson River. The partners, save in the case of Kemble, were unable to raise funds and this contract was never carried out.



Copy from the Original Drawing of the "Best Friend."

A year later, 1817, Captain Philipse agreed to turn over to the company two hundred acres of land in return for part of the stock. Ground was broken about June 1, 1817 at Cold Spring for a molding house, boring mill, pattern shop and a dam to supply power. A dock was built for the accommodation of vessels.

Labor skilled in this work was almost unknown in this country. A law in England forbade mechanics of that country from going abroad to practice or instruct others in their trade. In spite of this, one William Young, of Portglone, Ireland, a skilled iron worker and whose brother was the owner of some iron works in Belfast, was taken into the concern as a practical member. Various means were resorted to in order to get men out of the country. In one instance a number of laborers were shipped from Liverpool in a vessel and replaced by mechanics at Queenstown. The news leaked out and a war vessel was despatched to bring them back, but without success. In another instance, mutiny broke out upon leaving Liverpool, the captain put into a small harbor in Ireland, discharged his crew and enlisted new men. When the new crew arrived in New York, the men turned out to be first class molders!

At the same time ground was leased from the Rhinelander estate, at the foot of Beach Street, New York City for a fitting and a machine shop. It was here, in 1829 that the "Stourbridge Lion" for the Delaware & Hudson Co. was set upon blocks and tried under steam on May 28th, later to continue the journey up the Hudson River. Three other engines came from England, for the same road and these four were the first steam locomotives in the United States.

In this shop was completed the "Best Friend", first locomotive built in this country for the South Carolina Canal & Railroad Co. This engine had an upright boiler. It was followed by the "West Point", for the same road, with a horizontal boiler and then came the "DeWitt Clinton" for the Mohawk & Hudson R. R. Eight more locomotives were built by this firm and that concluded the locomotive work. Engines were constructed for many of the Hudson River steamboats, the most noted of which were those of the "Victory", the "DeWitt Clinton", the "Erie", the "Champlain", the "Utica" and the ill-fated "Swallow". The engines of the second steam frigate of the United States Navy—"Fulton the Second", for the "Missouri" and for the "Merrimac", whose career was as spectacular as the "Virginia" of the Confederate Navy—all were built at Cold Spring. The shop at Beach Street was moved to Cold Spring in 1838 and after this date all of the work was done at Cold Spring but the finishing and assembling of the locomotives is definitely associated with the Beach Street shop in New York.

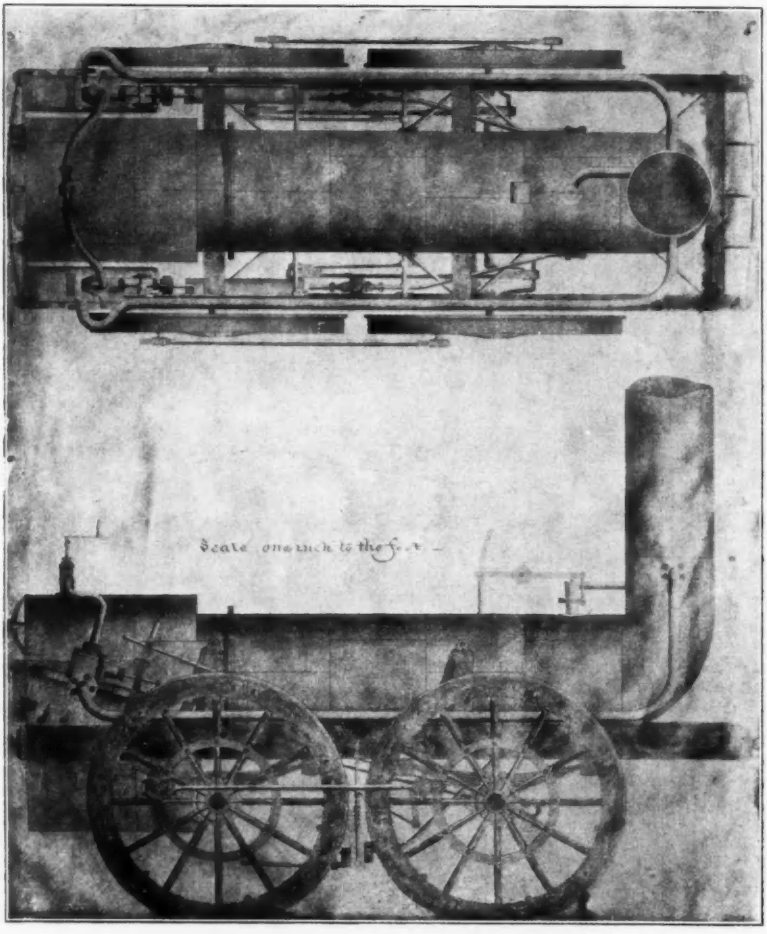
The manufacture of ordnance was the chief work and after many attempts they succeeded. From the making of small castings, sash weights, dumb bells, plow shares, grate and stove castings, they progressed by steady degrees to heavy castings and forgings, both iron and brass for marine and stationary engines, flour and saw mills, hydraulic presses for cotton, oil and paper; still their cannon was always looked upon as their specialty, it being guaranteed that the gun castings would have a strength of 30,000 lbs. per square inch.

A representative of the army and another from the navy were always in residence at Cold Spring to inspect the munitions made for the government. It was in 1833 that Lt. Robert Parker Parrott, later Captain, came to Cold Spring as the army representative. Gouverneur Kemble was soon aware of his ability, and on Oct. 31, 1836, Capt. Parrott resigned from the army and accepted the position of Superintendent of the foundry. Three years later he married Mary Kemble, the owner's sister, Mr. Kemble having bought out the other partners in the meantime and it was Captain Parrott who succeeded Gouverneur Kemble when he retired by leasing the works in 1857.

The Parrott gun had a longer range than any other cannon of the period and was adopted by both branches of the service. This gun consisted of a cylinder made from coiling a bar of wrought iron, welding the coils together and thus forming a cylinder which was turned and shrunk on the breech of the gun, thus preventing all danger of bursting. Ten-pounders of this pattern were made in 1860, twenty and thirty pounders the year following and later increased to three and four hundred pounders. The guns were tested by being fully loaded and fired at Storm King across the Hudson, holes made by the shells can be seen to this day. From eight to nine hundred men were employed here during the days of the Civil War and the prompt and efficient aid of this foundry had much to do with the final success of the Union armies.

Only one labor trouble, over wages, is recorded in the history of this company and this was during the draft riots of 1863. Captain Parrott considered patriotism as giving, not getting and furnished ordnance and projectiles on terms advantageous to the government and at a lower price than he would have exacted from anyone else. The men shared this patriotism and although they could have received more money elsewhere, they remained loyal to Cold Spring. Under the leadership of one John Ward, an Englishman, the laborers demanded more pay, drove the skilled workmen from the plant and threatened to wreck the works unless their demands were met with immediately. Upon request, the Governor of the State sent General John A. Dix, then commanding at Governor's Island and within three hours of the receipt of the despatch, two companies under the command of Major Milton Cogswell of the 8th Infantry were on their way. They promptly took charge of the situation, the malcontents were overpowered and since the authorities at neither West Point nor Governor's Island would accept John Ward, he was finally sent to Dry Tortugas. At the close of the war the government had a contract for a large number of guns and projectiles. Captain Parrott knew the government would have no need for this material and not wishing to profit by furnishing what would be of no use, offered to cancel the contract, which was accepted. A true patriot, yet he died a poor man!

In 1873 Gouverneur Kemble was stricken with paralysis, leaving him helpless. He had never married—Cold Spring was his child. He had nursed this infant industry to a healthy state of perfection, one that served its country faithfully in time of need. West Point was the post-office and the port of entry for the foundry and the cordial relationship



Copy from the Original Drawing of the "West Point."

that existed between Gouverneur Kemble and the officers of the military academy as evinced in the Saturday night dinners was never broken from 1817, the time of his coming to Cold Spring, until 1875, the date of his death.

Two years later, 1877, Captain Parrott died and the works fell to the management of Gouverneur Kemble's four nephews. They found themselves with enough work to keep the works busy for seven years. They felt no need of change, they owned the Parrott gun which was considered the best at the time. But new men, new inventions were springing up and larger foundries with newer methods were being built. It was the same story of aristocratic convention not keeping up with modern accomplishments. The wares of the West Point Foundry were simply outmoded, and in 1884, this historic institution closed its doors.

If the author has dwelt at considerable length on subjects other than the locomotives built by this concern, he must be forgiven. It would seem that the eleven locomotives built were only a venture and even William Mason, who built over seven hundred, admitted he built them only "for the fun of it!" No doubt the arrival of the "Stourbridge Lion" fired their enthusiasm that here was a profitable undertaking. Why they discontinued building, the records do not indicate. Time will not eradicate the fact that they were the first builders of locomotives in America.

In the Library of the Engineering Societies in New York City will be found drawings of the "Best Friend," the "West Point" and the "DeWitt Clinton." These are all that remain of their locomotive industry. The "Best Friend" and "DeWitt Clinton" have been described many times and it need not be repeated here. A survey of the early annual reports indicates they built eleven locomotives and I have arranged them, to the best of my knowledge, in the order of their construction:

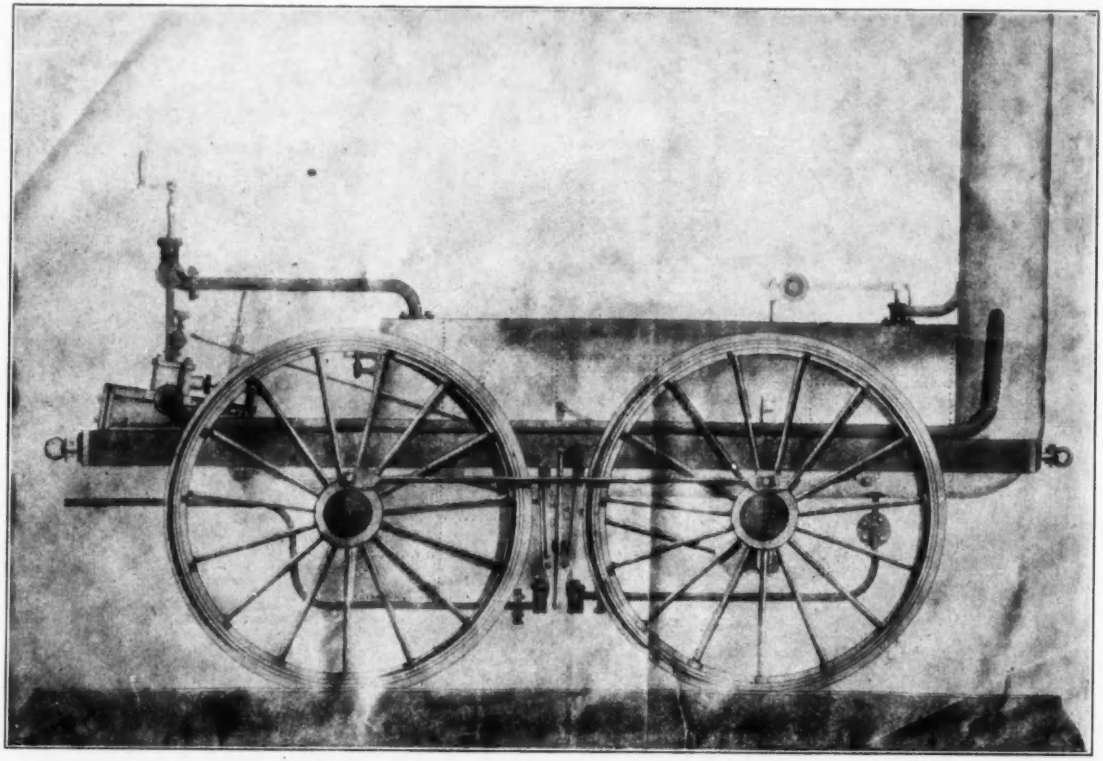
		Received	Cylinders	Cost
South Carolina Canal & R. R. Co.	"Best Friend of Charleston"	12-1830	6x16	$4,000.00
S. C. C. & R. R. Co.	"West Point"	4-1831	6x16"	3,250.00
Mohawk & Hudson	"DeWitt Clinton"	6-1831	5½x16"	
S. C. C. & R. R. Co.	"South Carolina"	1-1832		5,000.00
Mohawk & Hudson	"Brother Jonathan"	6-1832		
S. C. C. & R. R. Co.	"Charleston"	4-1833		5,750.00
S. C. C. & R. R. Co.	"Barnwell"	6-1833		5,750.00
S. C. C. & R. R. Co.	"Edisto"	9-1833		5,750.00
S. C. C. & R. R. Co.	"Hamburg"	10-1833		
Philadelphia, Germantown & Norristown	"Velocity"	1834		
Tuscumbia, Cortland & Decatur	"Comet"	1835	10x20"	

The "Best Friend" exploded, was rebuilt in 1831 and renamed "Phoenix." The "South Carolina" exploded Dec. 27, 1832 and was rebuilt in April, 1833.

The West Point Foundry will always be associated with the Parrott gun. Curiously enough it was "Stonewall" Jackson that sponsored this gun. As the result of the John Brown raid, the Commonwealth of Virginia in June, 1860, appointed a commission to purchase munitions for

that state. This commission visited the West Point Foundry and were invited by Captain Parrott to inspect his ten pound gun, just perfected. Major Smith, Chairman of the commission, asked what the Ordnance officials thought of rifled cannon to which Captain Parrott replied that they had shown but little interest. Major Smith liked the field piece and it was boxed and shipped with 100 shells to Lexington, Virginia. Again the gun was tested under the supervision of Major Thomas J. Jackson and it was upon his recommendation that the Parrott guns were purchased by the State of Virginia, the first to purchase this gun from the West Point Foundry.

Material for this paper was gathered from "Americana," Vol. XXX, No. 3, 1936; from an address of Gouverneur Kemble on the same subject at the Seventeenth Annual Meeting of the New York State Historical Association from the Proceedings of the Association, Vol. 15, pp. 190-203, 1916 and lastly to Mr. Guy E. Mauldin, Assistant Secretary of the Southern Ry. whose interest in the early engines on the South Carolina R. R. is untiring and who has been the means of turning up interesting references relating to their origin.



Copy made from the Original Drawing of the "DeWitt Clinton."

The Private Library of John Bloomfield Jervis

By William Conrad Kessler

In 1933, the Railway and Locomotive Historical Society published an excellent bulletin (Bulletin No. 30) by Mr. Spears devoted to the life of John Bloomfield Jervis (1795-1885), famous civil engineer of New York State. Mr. Jervis is still hardly as well-known as he deserves to be, even in upstate New York where he lived and died. Few people realize, for example, that Port Jervis, New York, is named after him in recognition of his work on the Delaware and Hudson canal which passed through there. Few more know that in connection with this canal he built the Carbondale Railroad on which was operated the first locomotive in the Western Hemisphere. Among his other great achievements was the construction of the Mohawk and Hudson Railroad and the Saratoga and Schenectady Railroad, the Chenango Canal with its unique system of artificial reservoirs and feeder canals, the Hudson River Railroad, the Croton Aqueduct for the New York City water system and other projects. Most important of all was his invention of the leading swivel or bogie truck for the locomotive (1832), a device which has been copied by locomotive builders of all the world. His life span covers the most important years of canal and railroad construction and operation and in it is reflected the history of the American railroad.

For these reasons, members of the Society and students of transportation problems should be keenly interested in the contents of Mr. Jervis' private library located in his old home in Rome, New York. This is now known as the Jervis Library Association, established in 1894 under the terms of his will whereby his books and three-tenths of his estate (about $44,000) were devoted to the creation of a public library for the city of Rome. From a nucleus of 2,449 volumes the library has built up under able leadership a collection of about 10,000 volumes, including a splendid file of early newspapers of Rome. Not all of these works, of course, are about railroads. Most of the books and papers on this subject and on canal construction are to be found in an upstairs room which also contains Mr. Jervis' cherry table and chair from his study. In addition to works on transportation, the original collection also contains books on mathematics, engineering, economic theory, religion, philosophy, travel and history. Many of the books were published prior to the Civil War.

The items which would interest members of the Society can be divided into the following groups and will be discussed in that order:

A. Periodicals.
B. Books on railroad construction, rolling stock and operation.
C. Railroad reports.

These may be divided into governmental and private reports and the latter may be further divided into surveys and propaganda for proposed

lines, financial reports to stockholders and special reports by management or investigating groups of stockholders.

D. Maps and guides.
E. Original plans and specifications drawn up by Mr. Jervis.
F. Private and official correspondence.

These last two groups include the most interesting and valuable items of the Jervis collection.

A. Periodicals.

American Railroad Journal, Vols. 1(1831) to 6. 12, 14 to 27(1854).

There is a wealth of information about early American railroads in these volumes, including some old timetables in the advertisements. There are no other periodicals about railroads in the collection, although *Hunt's Merchant's Magazine* contains many items of interest. Unfortunately, the file is not complete. It begins with Vol. 17 (1847) and ends (with omissions) with Vol. 41 (1859).

B. Books on Railroads.

It is impossible to list all of the books in this division but there is little doubt that it is a choice collection. The oldest volume is Tredgold, "A Practical Treatise on Rail-Roads and Carriages" (London, 1825). It was often referred to by Jervis in his early correspondence as well as Tredgold's book on "The Steam Engine" (London, 1827). Bound in one volume may be found three works by Walker, Robert Stephenson and Locke and Booth on fixed versus locomotive engines and the Liverpool and Manchester Railway (Philadelphia, 1831). One also finds "Rail Road Manual" by Long (Baltimore, 1829), Brown's "History of the First Locomotives in America" (New York, 1871), Oliver Evans, "The Young Engineers Guide" (Philadelphia, no date), etc. About twenty-five volumes comprise this division. Among them is one by Jervis himself, published in 1861 and (take a breath!) entitled: "A Treatise on the Construction and Management of Railways, designed to afford useful knowledge, in a popular style, to the holders of this class of property; as well as to railway managers, officers and agents." It is an interesting discussion in simple terms of the problem facing the railroad engineer in the construction and operation of a railroad. One learns, by the way, that the use of wood for fuel for locomotives was still almost universal in America in 1860 and it was only in Europe that ties were being treated against decay, although Jervis rightly guessed that the practice would soon be introduced into this country as the price of wood increased. There is also an interesting discussion of the presence of fraudulent and unfair practices among the promoters and managers of railroads. Jervis did not forget to include a discussion of the bogie truck. He also wrote another book later in life after retiring, called "Wages and Capital" which is a discussion of the labor theory of value and the then popular "wages fund."

C. Railroad Reports.

Governmental:

These are the more or less complete financial reports required by the regulating authorities of New York, Pennsylvania and Massachusetts. The New York collection is the most complete and includes the following volumes of the reports (with maps!) of the State Engineer and Surveyor (for a few years: of the State Railroad Commissioners): 1843-1848, 1850 and 1851, 1853-1855, 1857 and 1858, 1860-1866, 1868, 1870-1873, 1875, 1877, 1881. Those for Pennsylvania include only a few years and for Massachusetts from 1840-1853 and 1857. The difficulty with all these reports is that there is no way of knowing how accurate they are since the regulating authorities had little powers of enforcement until the eighties. They seemed mostly interested in costs of construction and the number and gory details of accidents (which happened all too frequently).

Private.

These are numerous and there are duplicate copies of some. The reports to stockholders are usually more detailed than those to the State. The most interesting are the pamphlets which describe in glowing terms the prospects for various railroad projects. One can read about the great possibilities of the Ogdensburgh and Lake Champlain (1847), now a part of the Rutland, and the state-aided Canajoharie and Catskill (1831). Included in this collection is the report made by a committee of stockholders of the newly consolidated New York Central in 1853 on the possible existence of internal mismanagement and fraud. They found nothing of importance but the report is interesting as an early example of conflict between stockholders and managements of railroads. Among the interesting railroads represented in these reports are the Black River and Utica (1854), the Albany and Susquehanna (1852 and 1854), the Western Railroad of Massachusetts (1835-1862), the Morris and Essex extension to the Delaware Water Gap (1850), the Baltimore and Susquehanna (1830) and also Redfield's famous "Sketch of the geographical route (sic) of a Great Railway," etc. (which proposed a railroad along the line of the present Erie). This is the second edition of 1830.

D. Maps and Guides.

As might be expected from a collection of an engineer, these are quite numerous, even if one excludes from them the maps and profiles of lines in which Jervis had a hand. The oldest is a map of New York State in 1804. The oldest foreign map is one of the canals of England, Wales and Scotland in 1815. Most of the maps are of American states and counties. In addition there are a few interesting little "Traveler's Guides" with maps and descriptions of Ohio

(1846) and the United States (1853) and Tuck's "The Railway Shareholder's Manual, or Practical Guide to all the Railways in the World" (London, 1847) and Whishaw "The Railways of Great Britain and Ireland" (London, 1842).

E. Original Plans, Profiles and Specifications.

Many of these are probably of greater interest to the engineer than to the historian or economist although some may be of general interest. For example, one may find the original report of Mr. Jervis to the "President, Managers and Company of the Delaware and Hudson Canal" on the projected Carbondale Railroad (1827) in which he recommends the use of locomotive engines. It closes with the following: "Its (the railroad's) successful accomplishment will form a new era in the internal improvement of our country: high dividing ranges or mountains will essentially loose (sic) their formidable character and no longer be considered as presenting insurmountable obstacles to any reasonable project to promote easy internal communication." The future was clear to Jervis, even over a hundred years ago.

Strange to say, there is little information about Jervis' connection with the Mohawk and Hudson but there is considerable about the less important Saratoga and Schenectady (now a part of the D. and H. and once a popular route to the famous spa). Maps and reports make the Hudson River Railroad well-represented. As is well-known, there were many obstacles of a legal and geographical nature in the way of this road but they were all overcome. There are many records of the operation of the Pittsburgh, Fort Wayne and Chicago (Jervis was superintendent in 1861) and the construction of the less important Cazenovia and Canastota (1869). In addition, there are many plans of bridges and the inclined planes of the D. & H. Canal and a few scattered plans of freight and passenger cars. Jervis' drawing of the famous swivel truck may be found in the vaults of the Rome Savings Bank, of which one of his living descendants, Mr. Beech, is president.

F. Private and Official Correspondence.

To the writer this represented the "Great Unknown" for a long time. Most of it was found in the shape of bundles of letters in a trunk, carefully tied together with a brief description of its contents written by Mr. Jervis outside each letter, (a handy device for the research worker). Mr. Jervis apparently disliked to throw anything away for there are about 1000 letters in the trunk in the library and the writer has been told that at his death there were fifty boxes of correspondence with instructions to discard them after various dates. The instructions were followed. (Even this trunk still contains some material of a personal nature such as receipted bills as far back as 1827, letters from and to relatives, etc.), But the most interesting discovery to the writer was the bundle of letters

concerning the affairs of the Delaware and Hudson Canal and the famous Carbondale Railroad from 1827 to 1830. The letters include copies of correspondence sent by Jervis to President Bolton of the D. & H. and to Horatio Allen, assistant engineer who was sent to England to make the famous locomotive purchases. One can read the original letters sent to Jervis by Bolton and Flewelling (treasurer of D. & H.) and by Allen while in Europe. These include Allen's studies of English railroads and his comparison of steam and horsepower, to the former's advantage. There are also letters from Allen while he was supervising the setting up and testing of the locomotives purchased in England, including the "Stourbridge Lion" and a few letters written by him as engineer of the Charleston and Augusta Railroad, where the first American-built locomotive was operated (Best Friend of Charleston). Out of all this correspondence there emerges a little more light about the first locomotives in the United States which may lead to a change in present ideas about their introduction. To this end the writer reproduces below some quotations and information from these letters in the hopes that Society members and other historians of the railroad will find them of value and interest.

Jervis to Horatio Allen (January 11, 1828).

Instructions for purchase of engines: if on six wheels, should weigh six to seven tons, preferably 6½. If on four, should weigh 5½ tons. J. would like six-wheeled engines if no trouble on curves. Speed should be 3½ to 5 miles per hour (!). Height of "chimney" not more than ten feet. J. wants *four* engines. These would cost about $1800 in the U. S. (it is significant that Jervis assumes that locomotives could be made here. Question: is this a price for *each* engine? Probably.)

Allen to Jervis (New York, May 21, 1829).

"We shall have *Stourbridge* together in a few days. The Kembles and their foreman Hall pronounce it the best piece of work they ever saw."

Allen to Jervis (New York, June 22, 1829).

"I agree with you in thinking it best to put the *Pride of New Castle* on the summit plane and find that we must take it to pieces before we send it up as not be (?) more than 18 inches are necessary on each side. The other Engine (the *Lion*) had better be placed at the head of Canal and place of labour before they are put up."

(This seems to indicate that the first two engines to arrive came together and that the second was named "Pride of Newcastle," not "America" as is sometimes assumed).

"I am completely tired of the City and of being asked when will Rail Road etc. be in operation. From the uneasiness with regard to the

completion of this work one would think that they had forgotten that in the beginning of 1825 nothing was done on it and now in 1829 a canal of 106 and a Rail Road of 17 miles over a peculiarly difficult country are all but completed."

Bolton to Jervis (Kingston, July 2, 1829).

"I learn from Mr. Allen that the Locomotives will be up tomorrow."

Bolton to Jervis (Kingston, July 4, 1829).

Locomotives arrived "yesterday morning."
(Both locomotives were therefore sent together to Honesdale).

B. G. Seward to Jervis (Bolton, July 16, 1829).

Contains a "bill of articles transported from Matteawan": Item: "2 Locomotive Engines."

Flewelling to Jervis (New York, July 22, 1829).

"By the arrival of the Britannia I have just received a letter from Messrs. W. & J. Brown & Co. of Liverpool in which they say 'We have rec' from Messrs. Foster, Rastwick & Co. an invoice for the 2d Locomotive Engine—am't. £488—which they inform us has been sent off, and we have no doubt it will be here in time for shipment on the Packet of 8th prox.—The other they say will be forwarded in ten days.' That letter from W. J. B. & Co. is dated the 29 May, and the packets of the 8th and 16th of June are daily expected which may bring both of the Engines—Will it not be better to suspend preparations for the Horse path at present?"

(Further evidence that 4 engines were ordered).

Jervis to Bolton, copy. (Honesdale, August 6, 1829).
"We have had the *Lion* on the Road from the Basin to about half across the creek—at this point one of the capts began to fail and we run (sic) her back a little. She stood on the Road all right. Since that we have loaded a waggon to 6 tons inclusive & run her across the Bridge & on to near the woods & back. By this we find it will be necessary to give additional support to our Bridge work." " . . . we have put the necessary work in progress."

(This shows that the *Lion* was probably pushed along the rails as a trial and that the weakness of the trestles was perceived before the official run a few days later).

Jervis to Bolton. Copy. (Honesdale, August 8, 1829).

"This morning we put steam on the Locomotive for the first time." Concluded that the curved part of the road, at least, with its fifteen foot stretches will need further support.

"The Locomotive will I think fully answer our expectations when we get the road firm enough to bear it."

(Still optimistic).

Bolton to Jervis (Kingston, September 10, 1829).

"The 3rd Locomotive came in here."

(Question: what became of it? What was its name?)

Jervis to President of D. & H. copy. (January 29, 1830).

"Consequences of failure (of locomotive) were greatly overrated." Was due to some mistake in weight of engine or strength of road. "An ardent desire to attain to the greatest degree the accomplishment of two primary objects in the work, led me to a proposition, that a more prudent regard for my own reputation, and the interest of the company would probably have prevented." "I do not despair of using Locomotives to advantage at least on a part of the road originally calculated for them." But will wait until mines and inclined planes completed.

(Still hopeful!)

Jervis to Leslie Combs, Esq. copy. (Carbondale, December 13, 1830).

"The distances for the use of Locomotive engines are so short, as to make it somewhat questionable whether anything will be attempted of this kind, until more experience is had on the subject & particularly in constructing engines of less weight than has hitherto been the practice."

(Project shelved!)

The Uintah Railway

By Linwood W. Moody

When the Interstate Commerce Commission late in 1938 gave permission to the owners of the Uintah Railway in Colorado to abandon their 72 miles of narrow gauge line, there passed into history one of the most unique railroads in the United States. Probably in all the Western Hemisphere, with the possible exception of some of the South or Central American countries, no railroad ever presented a more difficult operating problem with grades up to 7½ per cent and with curves varying from 4° to 66°, 233 of them in a single stretch of 13 miles.

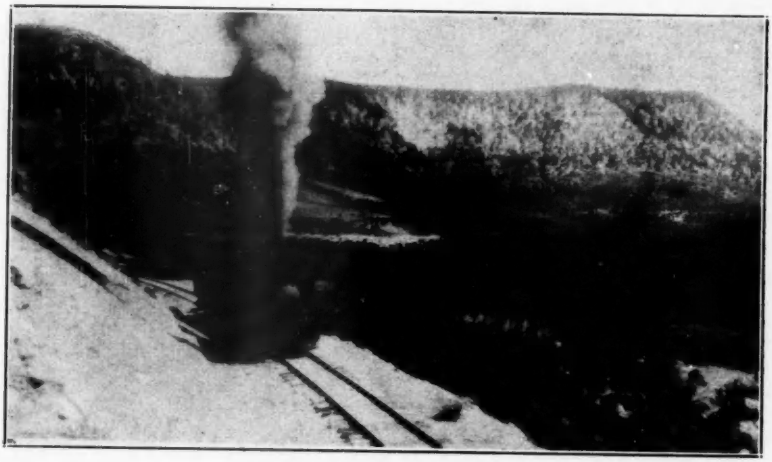
"If you are looking for a crooked railroad," an old railroad man once said, "take a look at the narrow gauge Uintah out in Colorado. The engineer and conductor can exchange greetings almost anywhere between Atchee and Wendella." These words bring pictures of winding curves set in the silence of deep canyons, or track creeping warily around precipitous ramparts; an impractical freakish sort of railroad unsuited for heavy traffic or the maintenance of regular schedules.

But the facts are far from such conjectures. The Uintah was a genuine freight-hauling railroad with modern equipment and up-to-date operating methods, a three-foot line whose tracks twisted around curves and climbed over hills that no standard gauge line would have dared survey. Instead of seeking some sheltered cleft it was perched high up on the outside of a towering mountain exposed to the full blast of summer heat and the merciless beating of the winter's snow and rain.

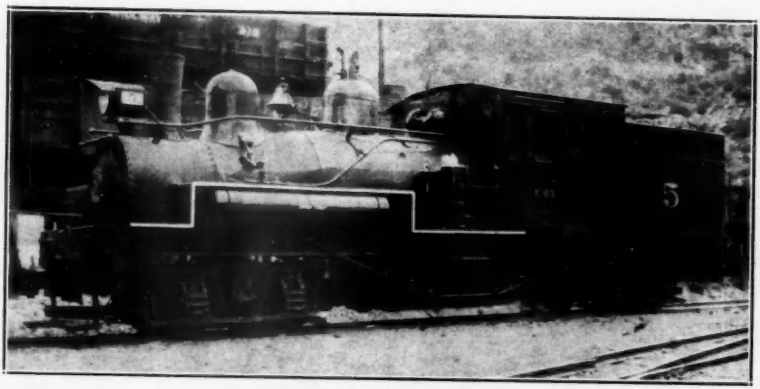
The main line started at Mack, Colorado, on the Denver & Rio Grande Western R. R., climbed the mountain ridge known as the Roan or Book Plateau and crossed the great Uintah Basin to Watson, Utah—three feet wide and 63 miles long. For the first eight miles it crossed a barren desert with little vegetation and no shade. Then it lifted into the sandy foothills climbing 2 and 3 per cent grades to Atchee, 28 miles from Mack. Beyond Atchee the first mile was 5 per cent grade, but from there to the top of Baxter Pass, 8437 feet altitude, was a stretch of mountain railroading beyond the most active imagination—five miles of steady 7½ per cent climb combined with a series of hairpin curves, the sharpest of which was 66 degrees.

The 66 degree curve, at Morrow Castle two miles above Atchee, was originally 80° but the big mallets bought in 1926 and 1928 could not negotiate it so it was reduced to a mere 66. Most of the other curves ranged from 30 to 50 degrees and there were twenty-seven that were sharper than 50°. The running time up or down Baxter Pass was fifty minutes and the operating rules sternly admonished train crews not to try it any quicker. Once in a while they did try it and a wrecking crew went out later from Atchee to pick up the pieces.

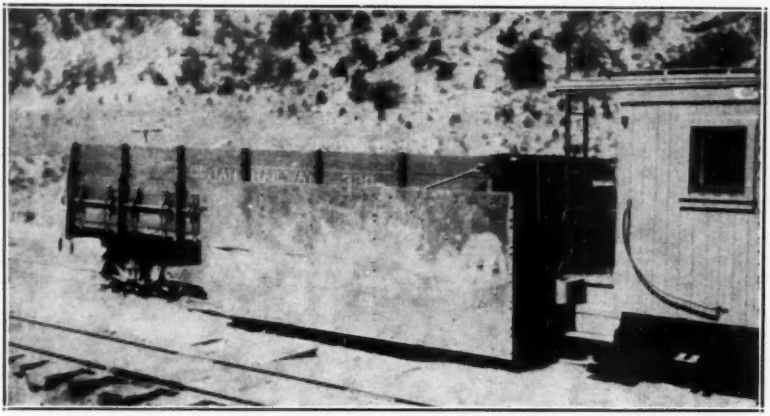
From Baxter Pass the road dropped down seven miles to Wendella, a 5 per cent grade with more curves, making a total of 233 in thirteen miles from Atchee. Probably no other common carrier ever had such a



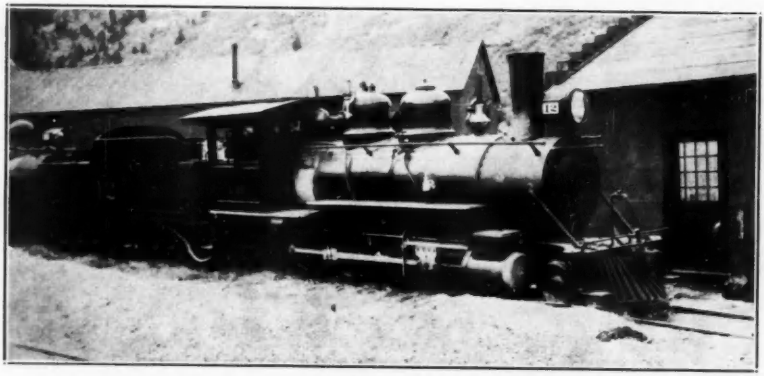
Passenger Service on the Uintah Ry.



Uintah R. No. 5. Lima, 1906.



The Snow Spreader on the Uintah Ry.



Uintah Ry. No. 12. Baldwin, 1896. Ex. F. & C. C. No. 36

section of track as this which scaled the outside of a barren mountain as curve after curve it gained altitude and finally disappeared over the summit. Pages could be written about this, the Uintah's big hill—the runaways, the wrecks, the ice and snow and the battles with weather, gradients and tonnage.

Between Wendella and Dragon the grade and curves diminished and the last ten miles across the Basin to Watson were a scant 1 per cent descent with practically no curves. From Dragon a 1.3 mile branch ran up to the mines but a disastrous fire wrecked the mines in 1910 and the branch was abandoned although the track was never taken up. Another branch ran from a junction near Watson to the Rainbow mines, four miles distant up a 5 per cent grade but with fairly easy curves.

The chief business of the Uintah Railway was the transportation of gilsonite, a brittle, black, asphalt-like mineral found in the Uintah Basin. This material is used in the manufacture of paint, varnish, printer's ink, insulating compounds, roofing and floor covering. Originally called "uintaite" it was later renamed "gilsonite" in honor of Mr. H. S. Gilson who developed it. The Barber Company, a subsidiary of the General Asphalt Company, who own the mines and operated the railroad, send this material to almost every country in the world. It is shipped just as it comes from the mine, in single sacks for domestic use and in double sacks for foreign shipments.

In the early days of the railroad the gilsonite was sent down to Mack in bulk in open top dump cars covered with canvas. The material is highly inflammable and when hot sparks from the locomotive occasionally dropped on to and ignited the canvas, things would sizzle for a while. Later the sacks were transported on flat cars, twenty tons to the car, and stored in Mack until shipped out on orders.

The mineral deposits, which the Uintah Railway was built to serve, were opened soon after the West was conquered but were never operated to any great extent until about the turn of the century. At first the gilsonite was hauled by mule team across the desert, 80 miles or so, to Price, Utah, the most convenient point on the Denver & Rio Grande, but it was a tough and expensive haul and the Barber Company decided to build a railway across the Basin to Mack, 63 miles away. The topography of the country and the cheaper cost of construction and operation were determining factors in the decision for a narrow-gauge road and the 3-foot gauge was chosen as best meeting all requirements. The road was incorporated November 4, 1903 and on February 1, 1905, the 53 miles from Mack to Dragon were completed and regular operations commenced.

The first locomotive was a 20-ton consolidation type bought from the Denver & Rio Grande for $3000., the "Tomichi," No. 55. This locomotive was used in the construction of the road and later for a while on regular trains. Three Shay geared engines were ordered from the Lima Locomotive Works and two others were purchased second hand from other Colorado roads. From Baldwin came a new consolidation and two side-tank passenger engines. The new Lima Shays were put to work on the big hill, the Baldwin consolidation handled freight from Mack to Atchee and the 30-ton Baldwin tank engines took the daily passenger trains over the road.

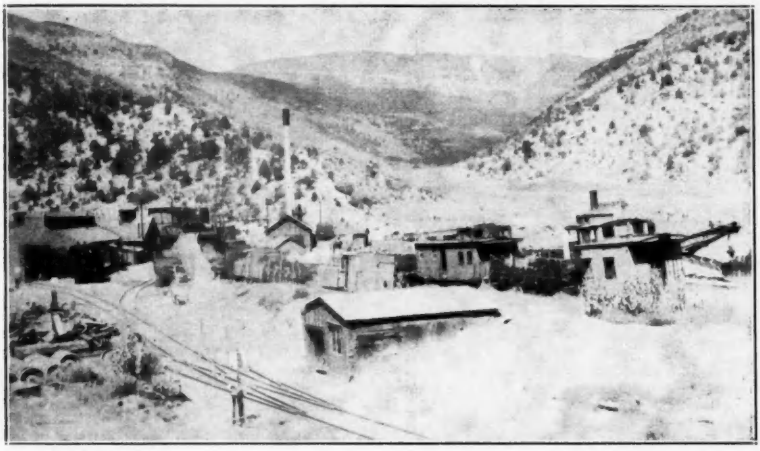
A passenger train left Dragon each morning, running down to Mack and returning to Dragon that night. Passengers remained over night there and left next morning by stage for Watson and Vernal. At first, horse-drawn stages were used and later, motor cars. The early days of motor transportation were not without their difficulties. Drivers and mechanics had to be educated to keep their cars and trucks in good repair and it was tough on the passengers when a car broke down in the desert, twenty miles or more from anywhere, and they had to wait until a relief car could come for them.

In 1911 the road was extended to Watson, the Rainbow branch was constructed, and two more locomotives, a consolidation and a mikado were purchased. The stage line from Dragon to Watson was, of course, discontinued but the 65-mile stage route to Vernal was continued until 1926 when other highways were opened that gave the interior better outlets. Where a few years before it took four days for the Salt Lake City morning paper to reach Vernal it could now reach there over the new highways the following day.

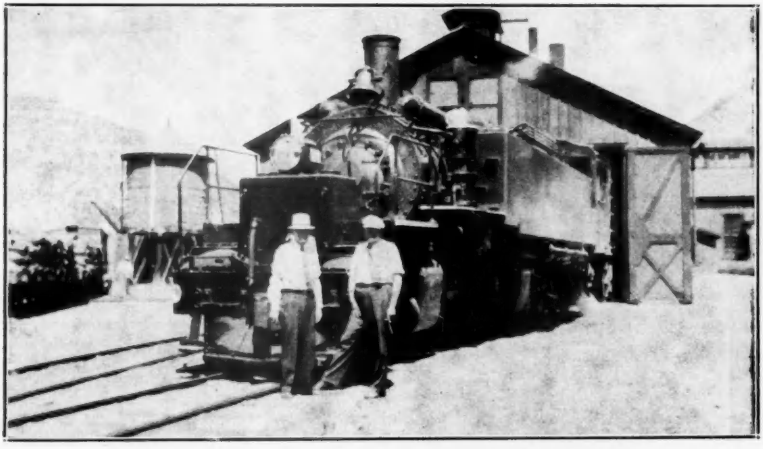
The mikado type locomotive purchased in 1911 was the road's first really big engine. It was so large that it could not be run over the mountain on its own wheels because the curves were too sharp for its long wheel-base. When this engine was delivered at Mack it was towed to Atchee where it was jacked up, the pony and trailing wheels removed, a pair of tender trucks placed under the front end and another pair under the firebox so that the engine was riding on the trucks with the drivers well clear of the rails. In this fashion it was hauled over the mountain by three of the Shays. This was in 1911 and No. 30 has never been east of Baxter Pass since. During these years No. 30 has switched back and forth between Dragon, Watson and Rainbow, staying nights at Dragon.

Light repairs were made by engine crews and every second Sunday a shop crew went up from Atchee to make heavier repairs. When a general overhaul was necessary, the engine would be dismantled and the parts carried down to Atchee. After repairs the parts would be hauled back to Dragon, there to be reassembled. "I remember once," tells Mr. Shafer, the master mechanic, "when she needed a new firebox. I went up to Dragon and cut the boiler in two at a seam and brought the rear part back to the shop at Atchee and built a new firebox on to it. Then we hauled the new firebox and part of the boiler back to Dragon and riveted it to the front end again. To add to our troubles we had to set up a pumping plant at Dragon to supply air for the riveting hammers."

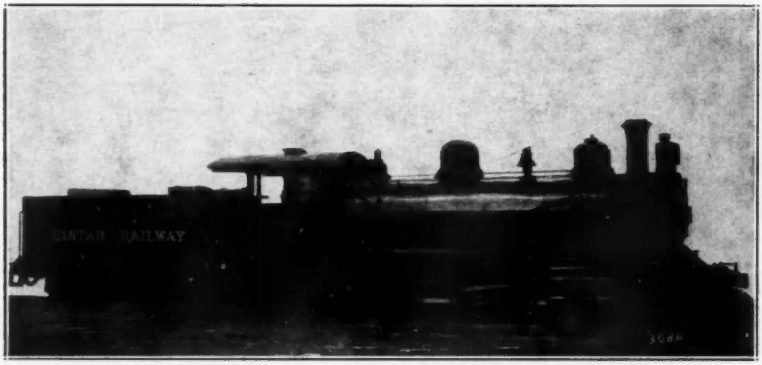
In 1917 another consolidation was bought second-hand from the Florence & Cripple Creek R. R. to help out on the desert run between Mack and Atchee and in 1919 the Barber Company sent the road another mikado similar to the No. 30 but 13 tons lighter. This engine had been built six years earlier for another General Asphalt Co. subsidiary, the New York & Bermudez Company's railroad in Venezuela. It proved too heavy for the swampy terrain down there and broke through a bridge on its maiden trip. After laying in disuse for several years this engine was crated and shipped to the Uintah where it was long one of the Uintah's most efficient and economical locomotives.



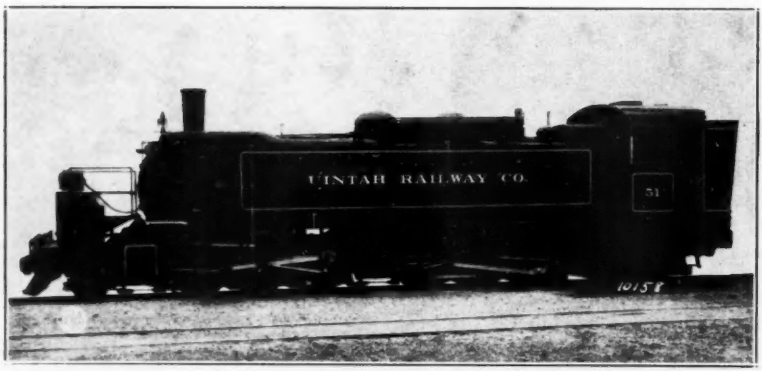
The Atchee Shops. In the distance, the white line, can be seen the road over Baxter Pass.



Uintah Ry. No. 71 with E. V. Earp, Supt., and H. S. Shafer, M. M.



Uintah Ry. No. 30. Baldwin, 1911.



Uintah Ry. No. 51. Baldwin, 1928.

As time went on, however, efficiency became more and more the subject of official consideration and the need for heavier power was felt. The Shays, which were handling all the freight over the mountain, were good only for 60 tons on the steepest grade, and the little side-tank passenger engines could haul exactly 35 tons, or one well loaded combination car.

Mr. L. C. Sprague, who is now ironing out the troubles of the Minneapolis & St. Louis R. R., was at that time general manager of the Uintah. Being a man of progressive ideas he decided that what was needed were some engines that could *climb* and from this decision a new type of engine was purchased—the mallet.

The first one was delivered in August, 1926, and immediately began to defend its unique position as the largest 3-foot gauge engine in North America, if not in the world. While speed was impossible on these crooked mountain miles this engine could handle, on the heavy grades, as much tonnage per train as two of the Shays and at considerably less expense. Being somewhat new and experimental in the narrow-gauge field it was not surprising that a few adjustments had to be made but when the necessary changes had been effected the efficiency of this engine soared beyond the fondest hopes of its sponsors.

Its success was confirmed two years later by an order for another similar engine and for ten years these two engines alternately hauled the tri-weekly mixed train from Atchee to Watson and return. To watch one of these mallets swing slowly around the hairpin curves was an experience in itself. They were so built that the two units of cylinders and wheels swiveled independent of each other and of the main engine frame. When rounding a sharp curve the nose of the engine hung out over the brink of the mountain while the wheels turned in a quarterly direction.

But the Shays were by no means retired. Every day a train left Atchee in the morning for Wendella with one or more Shays at the head end and extras or snowplow trains were always Shay powered. In winter when fierce blizzards rake the mountains these powerful little locomotives proved their worth. The Uintah's snow problem was not equal to that of the other Colorado narrow gauge roads—the Denver & Rio Grande and the Colorado & Southern, but it was nevertheless, a huge job for no rotary plow could negotiate the sharp curves and plowing had to be done with a small wedge plow. Usually two or three Shays fought their way through, shoving a wooden plow, making barely five miles an hour.

But *spreading* snow was a different proposition. When the plows had opened up a hole then the spreader was brought into action. This was an ordinary ballast car fitted with heavy side wings which swung out and shoved the snow back out of the way. It could be worked only on a descending grade and because it was necessary to use a little more speed, only one engine was used. If the crew was not careful and did not watch their speed, they stood a chance of high diving over the brink.

Because of the soil formation another source of worry was landslides and melting snows or heavy rains were almost sure to bring them. Once, in 1929, a slide near Baxter Pass tied the road up for thirty days

and cost $45,000. to clear. No wonder they kept three section crews posted on those thirteen miles between Atchee and Wendella. And small wonder that the special rules called for fifty minutes in running the six miles between Atchee and Baxter Pass.

But not withstanding its susceptibility to damage by the elements the Uintah's roadbed and track were kept in perfect condition. As tonnage and engine weights increased 50, 56 and 60 pound rail replaced the original 30 pound rail. Six-foot Oregon fir ties were used, 18 to the rail, and on the sharp curves in Baxter Pass the rails were tied together by steel rods.

Previous to the railroad the country was more or less of a wilderness and most of the stations listed on timetables were only a siding or water tank. The shops, engine terminal and Mack water supply were at Atchee, snugly under the sheltering slope of the mountain range. Mack being bone dry, the company converted several old locomotive tenders into water cars and used them to keep the junction point in fresh water. The same method was used to supply Dragon and Watson from the Wendella springs.

Due to the lime content of the water, all water for engines had to be treated and boilers were washed weekly to prevent scale formation. There were no turntables, but wyes were located at frequent points along the line for turning.

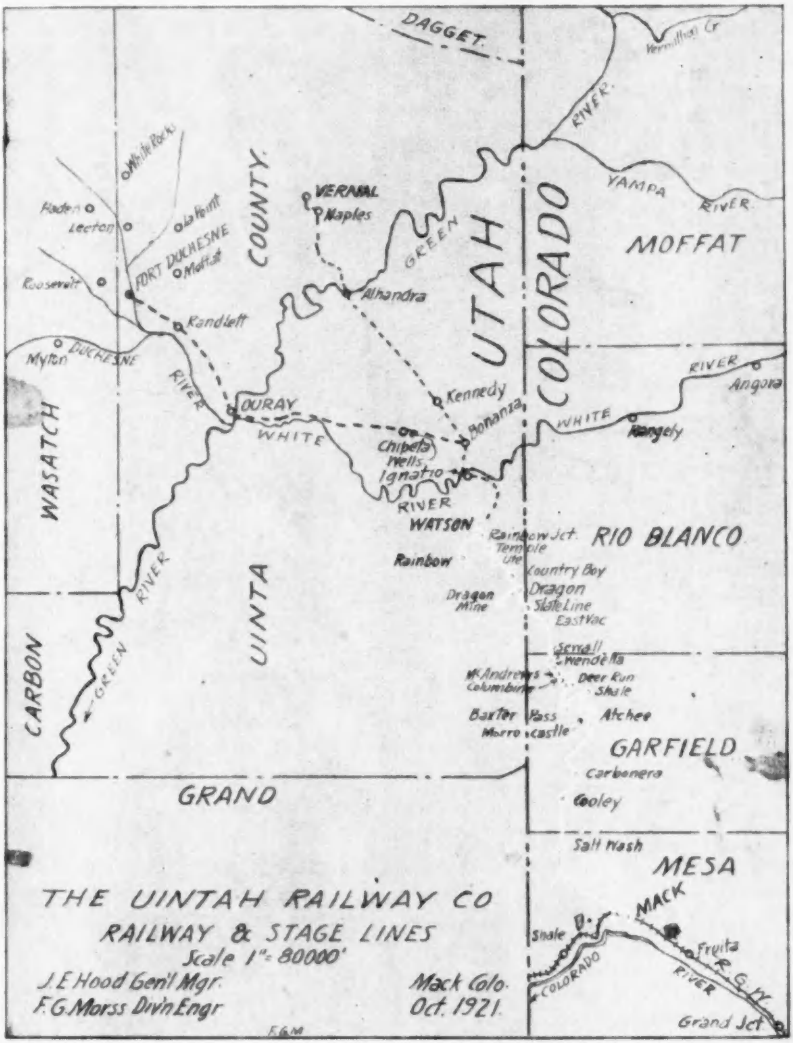
The company owned a coal mine at Carbonera and all that was necessary in order to take on coal was to run the engine alongside the mine shaft, which came out of the hill side and scoop the freshly mined coal into the locomotive tender. The company's telephone line paralleled the railroad and all train orders were sent by telephone, using standard orders and clearance forms.

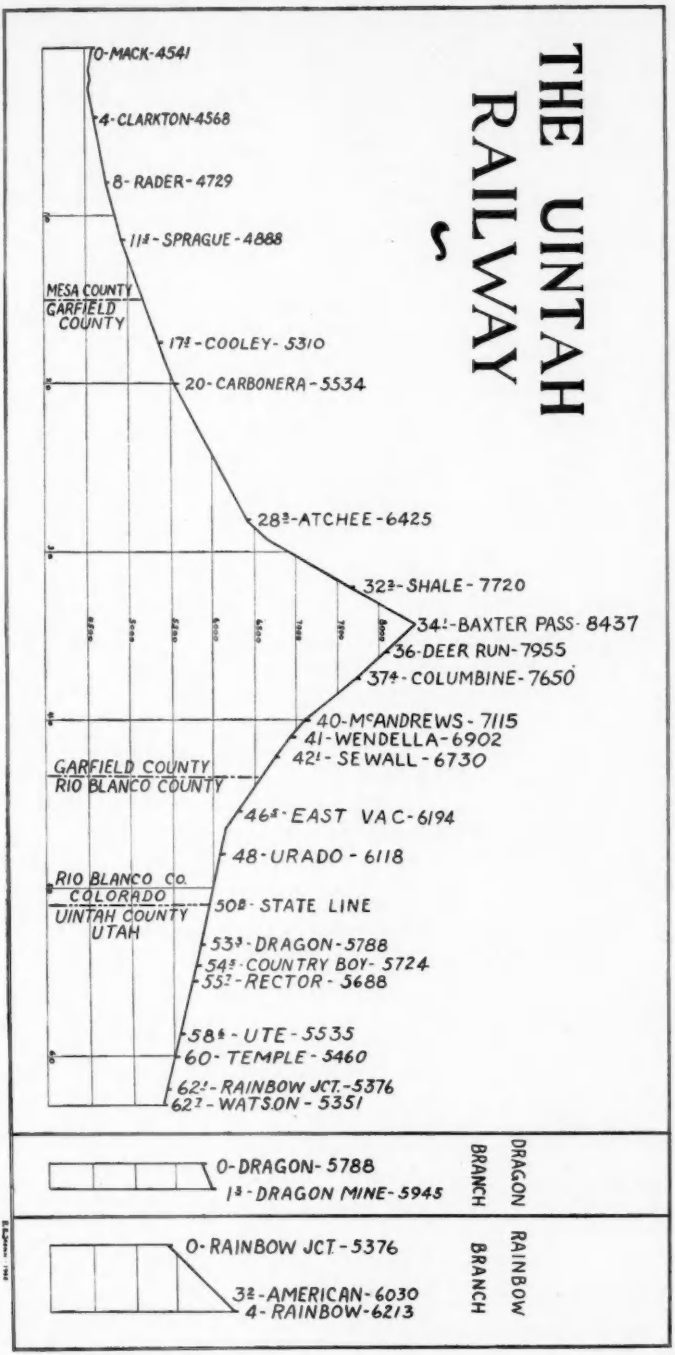
The Uintah owned 7 box cars, 11 stock cars, 21 dump cars, 71 flat cars and 17 pieces of work equipment. There were also three combined baggage and passenger cars, one of which was built at the Atchee shops. The other two were old Denver & Rio Grande sleepers, used when that road was narrow gauge through to Utah.

The freight cars were mostly company built. The last Shay engine, acquired in 1933, was assembled and practically constructed at Atchee. The company had a large stock of Shay parts on hand that would probably never be used so the Lima Locomotive Works built them a boiler and the road's own shops put the No. 7 together. The engine differed from the other Shay's in that it was only fourteen tons heavier.

Except for a few sheep, cattle, feed and a limited amount of general merchandise, there was little business for the road other than the transportation of mineral products. In spite of its scenic beauty there was little to attract the tourist and the few passengers who did pay seven cents a mile to ride were either local citizens or men connected with the mining operations.

Although there was no labor agreement between the company and their men, standard wages were paid and the men were members of the various brotherhoods. Practically all of the officials came up through the various grades which may account for the unusual harmony between


DAGGET
Vermillion Cr
RIVER
YAMPA
RIVER
MOFFAT
COLORADO
UTAH
COUNTY
WASATCH
UINTA
CARBON
GRAND
RIO BLANCO
GARFIELD
MESA
VERNAL
Naples
Maeser
Hayden
Leeton
White Rock
La Point
FORT DUCHESNE
Moffat
Roosevelt
Randlett
Myton
DUCHESNE
RIVER
OURAY
WHITE
RIVER
GREEN
RIVER
Alhandra
Kennedy
Bonanza
Chipeta Wells
Ignacio
WATSON
Rainbow
Rainbow Jct.
Temple Mtn
Country Boy
Dragon
Dragon Mine
State Line
EastVac
Scraall
Hendella
McAndrews
Columbine
Deer Run
Shale
Barter
Pass
Morro
castle
Atchee
Carbonera
Cooley
Salt Wash
MACK
Shale
Fruita
R. G. Jct.
COLORADO
RIVER
Grand Jct
RIVER
Angora
WHITE
Rangely
THE UINTAH RAILWAY CO
RAILWAY & STAGE LINES
Scale 1" = 80000'
J.E. Hood Gen'l Mgr.
F.G. Morss Div'n Engr
Mack Colo.
Oct. 1921
F.G.M


THE UINTAH RAILWAY
0-MACK-4541
4-CLARKTON-4568
8-RADER-4729
11⅛-SPRAGUE-4888
MESA COUNTY
GARFIELD COUNTY
17⅞-COOLEY-5310
20-CARBONERA-5534
28⅜-ATCHEE-6425
32⅜-SHALE-7720
34⅛-BAXTER PASS-8437
36-DEER RUN-7955
37⅝-COLUMBINE-7650
40-McANDREWS-7115
41-WENDELLA-6902
42⅛-SEWALL-6730
GARFIELD COUNTY
RIO BLANCO COUNTY
46⅝-EAST VAC-6194
48-URADO-6118
RIO BLANCO CO.
COLORADO
50⅜-STATE LINE
UINTAH COUNTY
UTAH
53⅜-DRAGON-5788
54⅝-COUNTRY BOY-5724
55⅞-RECTOR-5688
58⅛-UTE-5535
60-TEMPLE-5460
62⅛-RAINBOW JCT.-5376
62⅞-WATSON-5351
0-DRAGON-5788
1⅜-DRAGON MINE-5945
DRAGON BRANCH
0-RAINBOW JCT-5376
3⅛-AMERICAN-6030
4-RAINBOW-6213
RAINBOW BRANCH

officials and men. Most of the 60 or 70 men were with the road for years and were thoroughly familiar with its unusual operating conditions.

The rules demanded that every possible precaution be taken on handling trains on the big hill. Air brakes were carefully checked at Atchee before taking to the hill and at Baxter Pass before coming down. All retainers had to be set before descending a grade and trainmen were prepared to help with the hand brakes if necessary. One of the crew was always on the last car going up *or* coming down and a close watch was kept for sliding wheels. And, as has already been noted, every train or engine was required to use fifty minutes between Atchee and Baxter Pass and forty minuts from Baxter Pass to Wendella!

In later years accidents were not frequent but along the first they were not unusual. Like all good railroads the Uintah folks say little about these events but now that they are through operating it can do no harm to relate a couple.

One Sunday afternoon in 1917, for example, in a wet, drizzly rain, Engine No. 20 with a combination car was descending the big hill. The rails were slippery and, to make matters worse, the hand pipes on the engine clogged shortly after the train started. They eased away from Baxter Pass, toward Atchee, the crew at their posts and nerves steady. In a half a mile the train got out of control and shot forward picking up speed. With flanges screaming they rocked and swayed around the hairpin curves, lunging dizzily and the great open spaces swooped up to meet them. Suddenly the engine left the rails, plowed through ballast and ties, rolled over and over down the mountainside to finally stop—right side up! The combination car laid over on its side, pinning the conductor underneath—dead. He had been out on the front platform setting up the handbrakes and calling for the engineer to jump. The fireman jumped soon after the runaway started, but the engineer rode his engine until the drivers on his side lifted from the rails and rolled over. Although badly hurt he was soon out of the hospital and back on the job. The passengers who were all men jumped to safety.

Again, a Shay engine had been off the iron and in rerailing it the brake rigging was damaged and the line-shaft disconnected from the head trucks. In this condition it was a runaway from the start. With virtually no braking power the engine gathered speed and soon rolled over on a curve, rolling 800 feet to the bottom of the mountain. The crew escaped by jumping before the engine left the track.

Except for a twist of fate and the World War, this crooked road might have become part of a trunk line to the coast. Just prior to the war the owners of the Colorado Midland R. R. realized that by extending their road farther west, perhaps clear to the coast, their chances for longevity would be increased. Getting control of an electric line in Grande junction, by which to reach Uintah, they planned to standardize such portions of the Uintah as they could use. From Watson west a new line was to be built and the Midland would be independent of the D. & R. G. for a western connection. The project was so seriously considered that during 1915 and 1916 all tie replacements between Mack and Atchee and Wendella and Watson were made with standard gauge ties in prepara-

tion for widening the road. The new survey over the mountain would have been expensive to follow, but would have kept the maximum grade down to 4 per cent with a half-mile tunnel at milepost 33 to eliminate some of the sharper curves. How such an extension would have affected the future history of the Colorado Midland is hard to say, but probably some parts of that road would have been running today.

News of the abandonment came late in 1938 as a surprise to everyone outside the corporation. They claimed the gilsonite deposits at Rainbow had been exhausted and the new ones to be opened farther to the north could be better served by trucks, running to the Moffat Road at Craig, Colorado. Trucks, using the public highways were cheaper than extending the road to the new mines and so the Uintah Railway fell victim to its exhausted mines and trucks being able to carry the mineral products from the new mines over the public highways to a new shipping point.

LOCOMOTIVES OF THE UINTAH RAILWAY

							Date Acquired	
55	2-8-0	15x18"	36"	Baldwin	#5011	1880	1903	Ex D&RG "Tomichi" Sc 1911
1	Shay			Lima	888	1904	1904	Sc between 1913-20
2	" (3)	11x12"	32"	"	939	1904	1904	
3	"	"	"	"	1513	1905	1905	Sc between 1913-20
4	"	"	"	"	1575	1905	1910	Ex Waldorf Mining & Milling Co., Denver.
5	"	"	"	"	1674	1906	1910	Ex Argentine Central #3
6	"	"	"	"	3054	1920	1920	Sold—Feather River Lumber Co.
7	"	"	33"	"	R14298	1933	1933	Boiler from Lima—assembled at Uintah Ry. shops.
10	2-8-0	14x18"	36"	Baldwin	24271	1904	1904	Sold—Eureka-Nevada #10.
11	"	"	"	"	36093	1911	1911	Sc—1927.
12	"	16x20"	37"	"	14771	1896	1917	Ex F. & C. C. #36.
20	0-6-2T	13x18"	34"	Baldwin	25893	1905	1905.	
21	"	"	"	"	25953	1905	1905.	
30	2-8-2	19x22"	40"	Baldwin	36908	1911	1911	
40	"	17x22"	42"	"	40953	1913	1919	Ex N. Y. & B. Co.
50	2-6-6-2 (4)	15x22"	42"	Baldwin	59261	1926	1926	
51	"	"	"	"	60470	1928	1928	

William Frederick Harnden

Founder of the Express Industry

By Charles E. Fisher

William Frederick Harnden, son of Amariah and Sally Richardson Harnden, was born in Reading, Massachusetts on August 23, 1812. Here he received his education in the public schools but his poor health prevented his following the vocation of his father, that of a house-painter.

In 1834 he commenced working for the Boston & Worcester R. R., acting as conductor of the first train ever run by that road. He continued to act as conductor and later became ticket agent for the road at Boston. With assurance of steady employment he married Sarah Wright Fuller, of Newton, in December, 1835.

Again his health failed him and it is reported that James W. Hale, who ran the Tontine Coffee House at the corner of Pearl and Wall Streets, New York, suggested the idea to Harnden of a messenger service between New York and Boston and likewise suggested the use of the name —Express. We do not know if Harnden acted on this suggestion or whether it was his own conception, but we do know he soon put it into effect.

Up to this time small and valuable packages were entrusted to stage coach drivers, captains of vessels, or even the chance traveler, for a small consideration, the honesty of the individual being the only guarantee of delivery.

Advertisements of the service were inserted in the Boston and New York newspapers, and on March 4, 1839, armed with his carpetbag, Harnden made his first trip from the old Boston & Worcester Railroad station where the Albany building now stands. Without capital, influence or even health, the chances of his success seemed small. Business men found it difficult to accept the notion of paying a stipulated fee for a service sometimes performed gratuitously by others. Two months passed and the prospects were discouraging.

It was not long before the advantage of a messenger who was regular, prompt and trustworthy became apparent. By the end of the year other messengers were added, one of whom was a younger brother, Adolphus Harnden, who lost his life with the burning of the steamer *Lexington*. Another was Dexter Brigham, Jr., later to become a partner in the firm of Harnden & Co. and to continue the business after Harnden's death. It seems quite evident that these messengers travelled as passengers, with their carpetbags, over the several rail and water routes between Boston and New York.

In 1840 the Cunard Steamship Co. established its Liverpool-Boston service. This brought increased business to Harnden and more messengers were added for the packages that must be delivered to New York, Philadelphia and other eastern cities. The carpetbag became a trunk. Branches of the company were established in Philadelphia and as far west as Albany. It was here that Henry Wells, later of Wells, Fargo & Co. fame, was appointed manager. Harnden would not go west of Albany, his interest was in the European business with the eastern cities.

In the summer of 1841 Dexter Brigham, Jr., and J. L. Stone were sent abroad to establish branches in Liverpool, London and Paris.

In connection with this European business he was prompted to establish an easy transfer of money by means of bills of exchange. He was instrumental in securing for the immigrants a means of cheap transportation on a line of packet boats to Boston, thence westward over the Western (Mass.) R. R. and via the Erie Canal Boats. He is said to have facilitated the movement of over 100,000 laborers to this country in this manner.

Neither this business nor the express business was a financial success. Rivals appeared, among them in 1840 was Messrs. Burke & Adams, later to become known as the Adams Express Co. Harnden's energy, industry and perseverance far outran his scant health and he died on January 14, 1845, his business being absorbed by his rival—Messrs. Burke & Adams.

Among the documents owned by this Society we are fortunate to possess what is believed to be the first agreement between one or more railroad companies and a firm engaged in the express industry. Though a century has passed, some of the features expressed in this contract still remain in force. It is a document that has served as the basis of others and it marks the beginning of the gigantic express business of this country which started with a young man and his carpetbag. Appended to it are three famous signatures—Nathan Hale, President of the Boston & Worcester R. R., George Washington Whistler, builder of the Western (Mass.) R. R., acting in his capacity as Engineer and Harnden & Co., undoubtedly signed by William F. Harnden. The clarity of this document is such that it may be easily understood by all and we are certain that our members will be interested in reading it.

It seemed fitting that on the 100th anniversary of the birth of the express industry that a memorial commemorating the event should be prepared. The officials of the Railway Express Agency asked and received permission to place in the rooms of this Society a plaque to commemorate this event. On October 3, 1939, Mr. C. R. Graham, Vice President, Eastern departments, informally presented the handsome memorial plaque which we have illustrated herewith, to your society and your president in the same manner accepted it for your society.

In addition to Mr. Graham there was Mr. K. N. Merritt, General Sales Manager, also from New York. Representing the Railway Express Agency from Boston were Messrs. H. C. Trombly, General Manager; L. F. Whidden, General Agent and H. A. Hanson, Superintendent. The faculty of the Harvard Business School were represented by Prof. John C. Baker, Associate Director of Research; Dr. George P. Baker, Assistant Professor of Transportation; Dr. Arthur H. Cole, Librarian of the Baker Library and Professor of Business Economics and Dr. Clyde O. Ruggles, Professor of Public Utility Management. Representing the Society, in addition to Dr. Cole were Warren Jacobs, Secretary and your president. Following the presentation our guests were shown through the Baker Library and then all enjoyed a luncheon and a chat at the Faculty Club.

In Mount Auburn cemetery, in Cambridge, will be found an impressive monument to the memory of William F. Harnden. This was erected in 1866 by the express companies of the United States. And just across the Charles River, in the City of Boston, in our rooms in the Baker

Library will be found this handsome bronze memorial which will perpetuate the memory and pay tribute to the founder of our nation-wide express company.

Westn Rail Road 1841
no. 89

Package Express—Contract with Harnden & Co., Nov. 30, 1841.

This Contract of three parts made this fourth day of November in the year Eighteen hundred & forty one, between the Boston & Worcester Rail Road Corporation of the first part; the Western Rail Road Corporation of the second part; & William F. Harnden, & Dexter Brigham junior, of the City of Boston, common carriers & partners under the firm Harnden & Company of the third part,

Witnesseth;

that the said parties agree as follows, viz:—

The said Rail Road Corporations for the consideration hereinafter mentioned agree with the said Harnden & Brigham to furnish them with space & room upon a baggage platform belonging to the Western Rail Road Corporation & connected with the continuous passenger trains passing over the whole extent of said Rail Roads & over the Albany & West Stockbridge Rail Road, so that the said Harnden & Brigham may, every day, except Sunday, place on said platform & cause to be transported, casualties excepted, once each way, under their own lock & key, & in their exclusive custody, control & possession, a crate or box to be provided by them & not containing less than forty cubic feet, nor more than two hundred cubic feet; & that the said Harnden & Brigham may use the same for the conveyance on their own account & risk of any such articles as they may see fit to convey therein; except however the public mail, or articles which may be subject to take fire or explode, or mineral acids, or other dangerous or unlawful articles; & provided moreover that said Harnden & Brigham shall not carry at any one time in said crate, more than twenty five pounds average weight, for each cubic foot of room in such crate, unless they shall pay extra for the same as herein provided.

The said Rail Road Corporations further agree to allow the said Harnden or Brigham or any Agent appointed by them constantly to accompany said crate over said Rail Roads free of expense who shall have the sole care & custody of & access to said crate & its contents at all times & reasonable opportunity for putting in & taking out goods, at each station on the line of the roads where the train may regularly stop: but without requiring or receiving any of the attention labour or services of any of the Officers or servants of said Corporations: The said Corporations also agree that said Harnden may at any time pass over said roads free of expense on the business of said express.

The said Corporations also agree that, during the term of this Contract, they will not grant to any other person or persons the right to run a package-express over any part of said roads between Worcester & Albany.

And the said Harnden & Brigham, jointly & severally agree with said corporations, jointly & severally as follows, viz:—that they will pay said Corporations monthly for the right of occupying & using in manner aforesaid, the said space & room in the trains, the sum of One hundred dollars & also the sum of twelve & a half cents for every cubic foot of the capacity of said crate, for each trip; or instead of twelve & a half cents, such less number of cents per cubic foot as aforesaid, as shall for the time being, be hereafter established by said Corporations as the rate of transporting the highest class of freight in their freight cars between Boston & the Hudson River: provided however, that if during any portion of any trip, the weight of the goods in said crate shall exceed what the whole contents of said crate would weigh, if it were filled with goods weighing twenty five pounds per cubic foot, then & in evey [sic] such case instead of said payment of twelve & a half cents per cubic foot, the said Harnden & Brigham agree to pay for that entire trip (whether said goods are carried the whole distance or only part of the way,) the same rate for every hundred pounds weight of said goods which said Corporation shall, for the time being, charge for carrying the highest class of freight, in their freight cars from Boston to the Hudson River; the same being at present, ten dollars for two thousand pounds: It being agreed as between said Corporations that of all moneys paid by said Harnden & Company, the Boston & Wor-

cester Rail Road Corporation is to have one fifth, and the Western Rail Road Corporation, four fifths: this apportionment being agreed to by the Boston & Worcester Rail Road Corporation in consideration of the Western Rail Road Corporation's furnishing the baggage platform.

For the purpose of transacting his business as a common-carrier acceptably to the public the said Harnden agrees to establish Agencies & Offices at Boston, Worcester, Springfield, Westfield, Pittsfield, Hudson & Albany; but that the same shall not be so near to or otherwise connected with the offices of any of said Corporations, as to make the said Harnden or his Agents appear to the public to be Agents, officers, or servants of said Corporations.

The said Harnden & Brigham further agree that one of them or a servant of theirs shall at all times accompany said package crate, & shall have the sole & exclusive care, custody & responsibility of said crate & its contents.

And whereas the said Harnden & Brigham are fully informed of the condition & management of the said Rail Roads & of the locomotive Engines, cars & other apparatus used thereon & of the pains taken by the proprietors thereof to secure honest & skilful Agents & servants & are able therefore to estimate all the risks to which the said package crate & its contents & the person accompanying the same will be exposed at the depots & in passing over said roads; & have moreover secured a privilege exclusive in its character & of increasing value paying a moderate compensation therefor; Now therefore, the said Harnden & Brigham in view of these premises, have agreed to assume & do hereby assume all the risks aforesaid & agree to indemnify & save forever harmless each of said Corporations & the Albany & West Stockbridge Rail Road Company against all losses, payments, costs & charges to which said Corporations or said Company or any of them shall ever be subjected by reason of any loss, injury or distruction [sic] or casualty of any & every description which may happen to said package crate, or to the goods belonging to said package crate, or to the person accompanying the same.

And for the more perfect protection of the said Corporations against all such liability the said Harnden & Brigham further agree that in all advertisements & notices of their business as carriers over said rail roads, they will give notice that they or their Agents will constantly accompany & have the exclusive care & custody of their package crate & that they will be responsible for its contents; & that the Rail Road Corporations assume no liability whatever therefor; & they further agree that at the time of receiving every package to be transported by them they will give to the person leaving the same a printed notice to the same effect.

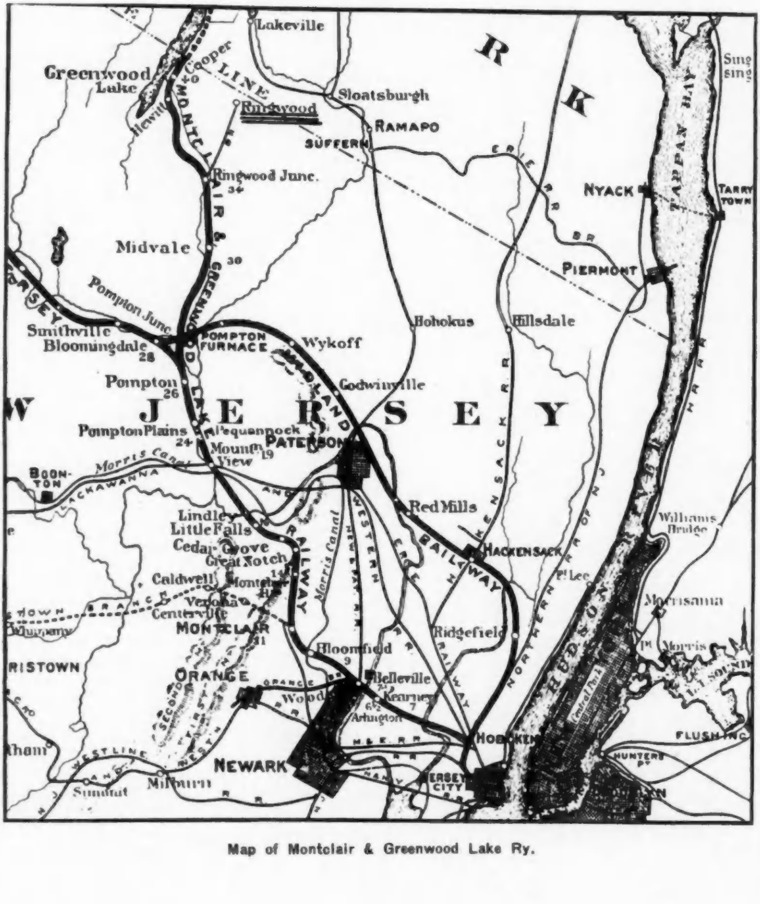
The said Harnden & Brigham further agree not to take any articles at Boston to be delivered at Worcester or at any intermediate point, nor any at Worcester to be delivered at Boston or any intermediate point.

They also agree to forward no freight between places east of Connecticut River & the Cities of Albany & Troy or places west of said Cities by any other route, than by the said Rail Roads; & further, that they will use all their influence to procure passengers & freight for said Rail Roads; & that they will adopt for the Winter conveyance of any express they may run for the whole or any part of the distance between Albany & New York such route as the Western Rail Road Corporation shall designate.

They also agree that at the determination of this contract they will render to each of the other parties hereto a full & detailed account of all their receipts & disbursements up to that time in their business carried on under this agreement.

It is mutually agreed that this agreement shall remain in force until the thirty first day of December, in the year Eighteen hundred & forty two, unless one or both of the said Corporations shall sooner determine the same on account of some breach of contract on the part of said Harnden & Brigham, or on account of said Harnden & Brigham's failing to perform their duties as package express carriers in a satisfactory manner: it being however provided that in the latter case said Harnden & Brigham shall be entitled to forty days notice in writing of the intention to put an end to this contract.

The Boston & Worcester Rail Road Corporation
by Nathan Hale Prest.
The Western Rail Road Corporation
by George W. Whistler Engineer.
Harnden & Co.



Map of Montclair & Greenwood Lake Ry.

The New York and Greenwood Lake Railway Company

By Norvin H. Green

It was the writer's fortunate luck last spring on going through some old family papers to discover a practically complete file of annual reports of the New York and Greenwood Lake Railway Company covering the eighteen years of its independent existence from 1878 to 1896. A perusal of these reports revealed a continuous struggle to run and operate a railroad without terminals, proper equipment or sufficient money. In only six out of these sixteen years did the line earn a profit and it is of interest to observe that many of the troubles of this line are quite similar to the present difficulties of what used to be some of our strongest railroad systems.

Organized originally as the Montclair Railway Company in 1867 it had been succeeded in 1875 by the Montclair and Greenwood Lake Company. The New York and Oswego Midland in its attempt to build by a system with New York Harbor as its eastern terminal, had guaranteed the interest on $700,000. first mortgage bonds sold to the public. Second mortgage bonds consisting of $1,800,000 were also sold, the proceeds of which had been used to complete the construction of the line. Interest having been defaulted on the first mortgage bonds, a receiver was appointed and under order of the Court of Chancery the entire property was sold to satisfy the creditors at Taylors Hotel, Jersey City, on June 5, 1878. On the same date and at the same place, the organization meeting of the New York and Greenwood Lake Railway Company was held and Abram S. Hewitt who was to hold the office until his death in 1903, was elected president.

The capital structure of the new company was as follows: Common stock—$1,000,000. having a par value of $50. a share, $900,000. of which was issued to the holders of the first mortgage bonds of the Montclair and Greenwood Lake Railway Company, and the balance to the holders of the old common stock at a ratio of $10. for each $100. held.

First mortgage bonds to the amount of $900,000. were issued to the old first mortgage bondholders at par and at par for the accrued interest and to cover the assessment on the first and second mortgage bonds. It was provided that holders of the new first mortgage bonds should return their new common stock to the company.

A second mortgage consisted of $1,800,000. was issued at par for par to the holders of the second mortgage bonds of the Montclair and Greenwood Lake Railway Company who accepted the plan.

The new first mortgage bondholders were entitled to vote at all meetings and to be entitled to as many votes as they would have had if owners of stock of a similar par value.

Interest on both issues was to be payable only unless certified as earned by the board of directors over expenses and repairs during the six months ending one month before such time for half yearly payments.

The interest on the second mortgage was subject to the payment of that on the first mortgage bonds and these bondholders had no vote at annual meetings.

The sale was confirmed by the Court and the title passed in October 1878, the purchase price being $156,000. The purchasers were Cyrus W. Field, Abram S. Hewitt and John B. Dumont, the committee appointed by the first and second mortgage bondholder committees. At the time of the sale, $671,900. out of $700,000. first mortgage bondholders and $1,046,700 out of $1,800,000. had assented to the plan and paid an assessment of 5% in cash. Subsequently, all other non-assenting bondholders were permitted to participate in the plan by the Purchasing Committee.

To cover the exchange of the old first mortgage bonds, accrued interest on same and the assessment on the old first and second mortgage bonds, $899,692.05 of new first mortgage bonds were issued leaving $307.95 in the treasury. Of the old second mortgage bonds as stated above, $1,046,700. assented and $292,200. were admitted subsequently. $340,456. of the non-assenting bonds were allotted to assenting bondholders and $120,644. were allotted of the purchasing committee to the New York Lake Erie and Western Railroad Company.

Of the total assessment of $124,456., the old first mortgage bonds paid $34,456. and the old second mortgage bonds $90,000. making a total received of $124,456.00.

Of the $124,456. received in the assessment, $76,653.49 was expended for settling claims, reorganization expenses and a dividend of 16-67/100% or $4,544.43 on non-assenting first mortgage bonds. This left a cash balance of $48,802.51 in the treasury of the new company, a sum lamentably small in view of the wretched condition of the railroad.

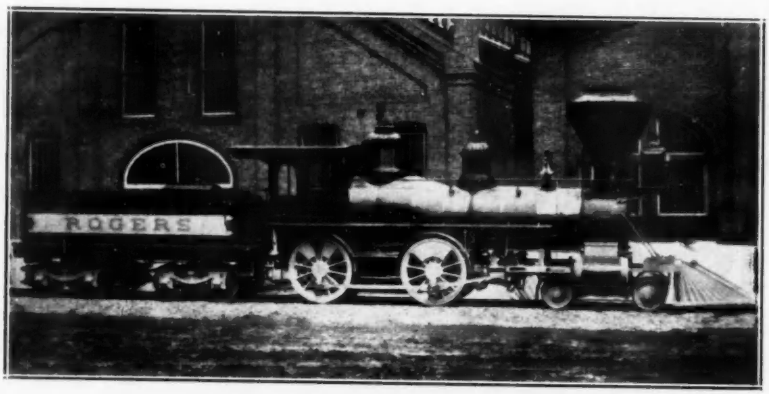
On taking over the property the new company found the condition of the roadbed and equipment to be lamentable and in order to continue operations it was found necessary to immediately replace 6000 ties and to lay 75 tons of new rails. The locomotives were also in such poor repair that they had to be repaired one at a time during which time it was necessary to hire a locomotive at a rate of $125. per month. Furthermore, a sudden freshet in the Passaic River had damaged the right of way to the extent of $3,000.

Since the date of its organization the line had always used the Pennsylvania terminal in Jersey City by using the tracks of the New York Susquehanna and Western. By shifting its terminal to that of the New York Lake Erie and Western in Jersey City about $37,500. a year in charges were saved as the use of this terminal could be had free except for ferriage charges.

In order to further economize, all salaries were discontinued with the exception of a superintendent and clerk at $260. a month. Having no shops or terminal of its own the line was forced to use those of the New York Lake Erie and Western under contract and was therefore entirely at the mercy of the latter road.

As an interesting commentary on the operations of a railroad in the late seventies the following quotation from the annual report of the

N. Y. & G. L. "Orange." Cooke, 1871.



M. & G. L. "Greenwood Lake." Rogers, 1874.

president issued May 5, 1879 is of interest: "Now it is a well known fact that the cost of running a railroad with reasonable allowance for imperative improvements is $1 a mile. Until more than $15,000. is earned annually there can be no surplus for the payment of interest."

The prediction that large expenditures for putting the road in condition for safe operation was a correct one was shown by the President in his report for the thirteen months ending December 31, 1879.

"The directors think it safe to say that the whole loss, $35,221. is covered by expenditures of an extraordinary nature upon the roadbed and rolling stock. The roadbed is now in excellent order. The engines have thoroughly been repaired and two new hard coal burning engines have been purchased and charged off to construction. The cars have been put in excellent order and although the work of construction is not yet completed the company has no reason to be ashamed of either the road or its rolling stock."

During this year the disaster of the Hackensack Bridge occurred and although no details are available to the writer it was caused by the violation of the rules by an employee who lost his life in the accident. All damage claims were amicably settled except one and the litigation which resulted plagued the company for years.

The predecessor companies not having taken the proper steps to acquire a clear title to the right of way, during the year 1879, over $21,000. was expended in settling outstanding claims. However, one windfall which the company unexpectedly received and which helped the financial condition greatly were the old Montclair Railway bonds which had been guaranteed by the New York and Oswego Midland. Under the plan of reorganization of the latter road, the bondholders were entitled to common stock on the payment of $20. a share. Not having the funds to subscribe to this stock, the rights were sold netting the sum of $25,010.

During the year 1879 the general improvement of the road was continued and sufficient new steel rail to relay the track between Jersey City and Montclair was purchased. Contracts were also let to replace all wooden bridges with iron ones at a cost of $40,000. with the exception of the Hackensack bridge. The dilapidated condition of the wooden trestles may be seen by the fact that the lumber bill of the company for 1880 was $9,828. However, the work of filling the trestles was continued during that year, and it was expected this would be completed during 1881. This same year new stations were constructed at North Newark and Little Falls, the residents of those places paying one-half of the cost, and the track from Greenwood Lake to the state line was relaid. The terminal was moved to the latter place at which point a dock was built where steamer connections could be made at all stages of water in the lake.

In order to meet the operating loss and to pay for the improvements to the property, advances had been secured from time to time from the firm of Cooper and Hewitt and the New York Lake Erie and Western R. R. Company, the two largest holders of securities of the road. On December 31, 1880 these advances amounted to $63,001. and were secured by taking the title to various portions of the right of way and rolling

stock in the name of Abram S. Hewitt as trustee, who executed a deed of trust to secure same, which provided that the property would be deeded to the company when these advances were repaid with interest. The officers estimated that a total of over $200,000 in all would be required to keep the road going and to put it in good condition.

Gross earnings continued to increase annually, as will be seen from the attached table to and including the year 1888 when they fell off again in 1890, to rise again steadily in 1896, the year of the lease to the Erie R. R. Expenses continued to mount, and including the loss on the Watchung R. R. and the heavy burden of state taxes, a profit was only made in 1885, 1891, 1892, 1893, 1894 and 1895.

During the year 1880, control of the Watchung R. R. was secured by parties interested in the New York and Greenwood Lake R. R., who expended over $100,000. to complete and improve this line. From an operating point of view it never was a success as it never earned a profit, but for many years until June 1, 1889 it was operated by the New York and Greenwood Lake R. R. Co. on the basis of paying expenses and dividing the profits, if any, between the two roads in proportion to the mileage. The officers of the latter road estimated that the gain in business to the main line would offset the loss in operation of the Watchung R. R. In 1889 in order to try and improve the business of the Watchung R. R., a large number of fast trains were put on the line, but the results of this experiment were a failure.

On June 1, 1889 the operation of the Watchung R. R. was turned over to the New York Lake Erie and Western R. R. Co. as the burden was too great for the New York and Greenwood Lake R. R. to carry. The agreement provided that the latter road would operate the Watchung R. R. on the basis that for the use of four miles of the New York and Greenwood Lake Railway main line the latter secured the use of an equal amount of mileage on the New York Lake Erie and Western R. R. free. This arrangement freed the Greenwood Lake from all terminal expenses save that for transfer of freight and passengers across the Hudson River.

Unfortunately, it is not within the scope of this article to describe the struggles on the part of the management to keep the line going and to try and improve it. It is sufficient to say that by December 31, 1889, Cooper and Hewitt and the New York Lake Erie and Western R. R. had advanced over $300,000. which was in the form of floating debt.

On that date the entire track had been relaid with steel rails, all trestles had been filled in, and all bridges rebuilt except that one over the Passaic at Newark. The estimated cost of repairs to this bridge was $20,000. and it was proposed to bypass it by making a connection with the Paterson and Newark branch of the Erie as had been done in the case of the Hackensack bridge some years before by a connection with the Arlington R. R. a subsidiary of the New York Lake Erie and Western R. R.

During the year 1890, the Caldwell branch was under construction and this was opened in the following year. It was hoped that the extension of this line to Morristown, Boonton and Lake Hopatcong would greatly increase the earnings of the Greenwood Lake Railway.

At the annual meeting in May 1891, the stockholders and bondholders voted an issue of $500,000. Prior Lien 5% bonds, it being the intention of the Company to refund the $350,000. advance of Cooper and Hewitt and the New York Lake Erie and Western R. R. It was provided that Cooper and Hewitt and the New York Lake Erie and Western R. R. would accept these bonds at par and release all liens held by them to secure their advances.

The question of equipment had always been a source of worry to the management, as the line had always woefully been short of locomotives and cars. Poor's Manual for 1892, which is the first one available to the writer, which gives a list of the equipment, states that on June 30, 1891, the road owned 6 locomotives, 17 passenger cars, 7 baggage and express cars, 32 flat cars and one caboose, a total of 57 units in all. The high cost of hiring equipment was outlined in the report for the year 1890 as follows: "During the past year we have been compelled to hire from five to seven engines daily from the N. Y. L. E. and W. R. R. at an average cost including repairs, of $9.07 a day, of which $3.50 for rental and $5.57 is for repairs of each engine. The Erie Company have been able to use some of our engines, for which a corresponding allowance has been made but the net balance against us amounts to $12,500.01. It is apparent that this amount would warrant the purchase of at least six first class engines, the possession of which would enable us to operate the road with greater economy and efficiency and still have a considerable surplus over interest in the investment applicable to the payment of the principal sum representing the cost of the engines. It is plainly, therefore, to the interest of the company to procure additional engines under a similar trust agreement to that which secured for us ten passenger cars two years ago. Under this arrangement ten first class cars were purchased for $49,000. which was supplied on a car trust guaranteed by the N. Y. L. E. and W. R. R., the principal of which was payable at the rate of $5,000. per annum. The Erie Railroad Company have paid $14,000. of the principal sum and interest amounting to $6,325., making a total of $20,325. no portion of which has been charged to the N. Y. and Greenwood Lake Railway. The result has been that we have had the use of these cars without the payment either of principal or interest or of mileage. Unless, therefore, we shall refund to the Erie R. R. Company the amount thus advanced for principal and interest, there will be necessarily a charge for the mileage of these cars, which will add to the deficit already existing a corresponding amount, and to that extent will be an additional advance to be credited to the Erie Company".

At the 1894 annual meeting the President recommended the lease of the line to the N. Y. L. E. and W. R. R. but owing to the receivership of the latter, nothing further was done until 1896. Prior to leasing the line to the Erie R. R. the capital structure of the company was changed. The issue of Prior Lien bonds were increased to $1,500,000. and holders of the first and second mortgage 6% bonds exchanged their bonds for prior lien bonds at 50% of par for the old first mortgage bonds and 10% of par for the second mortgage bonds. This reduced the funded debt of the line by $2,070,000.

On May 1, 1896, the line was leased to the Erie R. R. for 999 years at a rental of 5% on the bonds and corporate expenses. Since then the history of the road has been uneventful as it has been operated as a division of the Erie system. Severe floods in the Passaic watershed in the autumn of 1903 caused damage to the road and service was suspended for several weeks in the northern end of the line.

With the construction of the Wanaque Reservoir by the North Jersey District Water Supply Commission in 1926 about six miles of line in the neighborhood of Erskine were relocated above the flow line. Finally, about 1935 the upper end of the line from Erskine Junction to Greenwood Lake was abandoned and the track torn up. The natural ice business had fallen by the way-side before electric refrigeration and therefore that portion of the line was no longer self supporting.

The Erie R. R. went into reorganization under 77B in the autumn of 1937 and interest on the Prior Lien Bonds of the N. Y. and Greenwood Lake were defaulted in May, 1938. To date there are no plans for reorganization of the Greenwood Lake but it seems to the writer safe to assume that a drastic scaling down of the Prior Lien Bonds must take place.

It is quite evident that the New York and Greenwood Lake Railway Company should not have been constructed as it was finally laid out. The territory from Jersey City to Pompton was adequately served by the Erie, Lackawanna and the N. Y. Susquehanna and Western. While the growth of the population in this territory was steady, there was little manufacturing along the line.

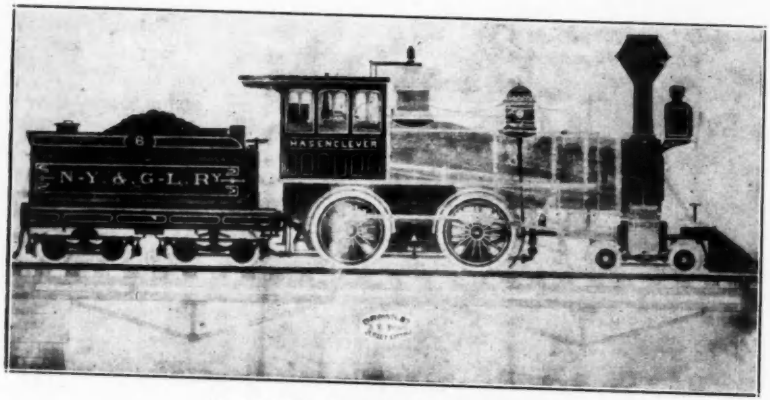
The iron mines at Ringwood which were closed down in 1932, gave the road a varying amount of iron ore to haul for many years. Likewise, the natural ice business and Greenwood Lake provided a good deal of traffic. Both these industries were subject to wide fluctuations and could have been adequately handled by a line from Greenwood Lake and Ringwood to Pompton Junction.

One final word as to the interest of the firm of Cooper and Hewitt and the New York Lake Erie and Western in the property. The former were the owners and operators of the Ringwood Mines and the ice business on Greenwood Lake. The latter, always one jump ahead of the sheriff, was willing to back the Greenwood Lake in the hopes of improving its own position.

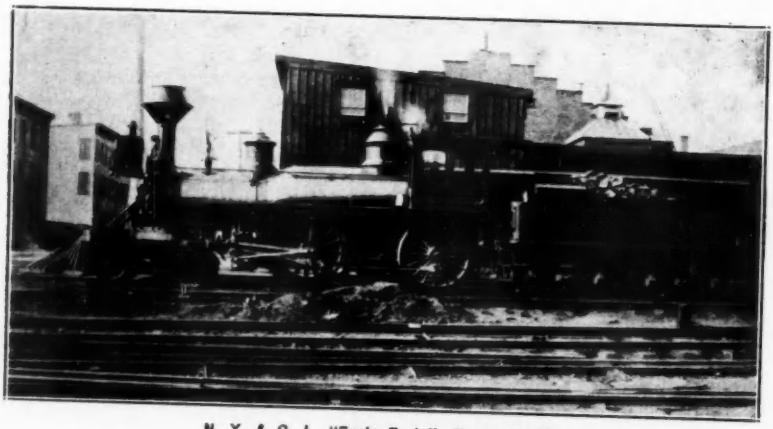
LOCOMOTIVES OF THE MONTCLAIR & GREENWWOD LAKE RY.,

Later the New York & Greenwood Lake R. R.

					Delivered
1	Ryerson	Danforth Cook & Co.	4-4-0	15x24"	5-15-1871
2	Orange	Danforth Cook & Co.	4-4-0	12x22"	6- 8-1871
3	Bloomfield	Rogers #2369	4-4-0	17x24"	3-30-1874
4	Greenwood Lake	Rogers #2374	4-4-0	16x24"	3- 1874
5	Ringwood	Rogers #2388	4-4-0	16x24"	1879
6	Hasenclever	Rogers #2397	4-4-0	16x24"	1879
7	Eagle Rock	Rogers #519	4-4-0	16x22"	.....
8	Llewellyn	Rogers #528	4-4-0	16x22"	.....



N. Y. & G. L. "Hasenclever." Rogers, 1874.



N. Y. & G. L. "Eagle Rock." Rogers, 1874.

The No. 3 was built for the Levis & Kennebec Ry. and No. 4 was built for the Louisville, Cincinnati & Lexington R. R. Both were returned to the builder when not paid for during the panic of 1873 and they were sold to the Montclair & Greenwood Lake R. R.

Nos. 5 and 6 were purchased from the New Jersey & New York R. R. in 1879. Both were built in 1874 and carried Nos. 3 and 8 on that road.

Nos. 7 and 8 were purchased from the Pennsylvania R. R. They were built in 1864 for the New Jersey R. R. & Transportation Co. and carried road Nos. 37 and 38.

(The author wishes to thank Mr. W. A. Lucas for his kindness in furnishing him with the four photographs of the locomotives that accompanied his article and the American Locomotive Co., for furnishing certain details in the above roster.)

NEW YORK & GREENWOOD LAKE RAILROAD

Operating Results for the Years Ending December 31st.

Year	Operating Earnings	Operating Expenses	Operating Loss or Gain	Other Income	Loss Subsidiary's Interest, Rents, Taxes	Profit and Loss
1879	$118,231.89	$149,456.67	$—31,224.98		$— 3,997.00	$—35,221.98
1880	133,452.04	155,071.76	—21,619.72		—10,202.31	—31,622.03
1881	154,356.67	198,360.52	—44,003.85		—38,233.47	—82,237.41
1882	175,100.46	154,688.64	+20,411.82		—24,067.38	— 3,655.56
1883	172,968.95	166,493.49	+ 6,475.46		—18,249.60	—11,774.14
1884	181,444.45	175,724.34	+ 5,670.11		—27,334.62	—21,664.51
1885	188,474.25	166,960.69	+21,513.56		—19,149.60	+ 2,363.96
1886	228,168.85	219,930.07	+ 8,238.78		—17,895.03	— 9,656.25
1887	243,546.54	235,137.23	+ 8,409.31		—30,173.51	—21,764.20
1888	265,653.61	276,127.63	—10,474.02		—42,378.40	—52,852.42
1889	246,403.35	251,304.09	— 4,900.74		—23,268.60	—28,169.34
1890	224,465.80	214,951.01	+ 9,514.79		—14,556.23	— 5,041.44
1891*	258,120.20	228,509.13	+29,827.07		—14,652.08	+15,174.99
1892	351,861.23	291,369.68	+60,491.55		—44,851.67	+15,639.88
1893	349,014.51	295,862.17	+53,152.34		—51,819.27	+ 1,333.67
1894*	383,541.86	342,893.29	+40,648.57		—32,737.40	+ 7,911.17
1895*	396,842.95	347,647.45	+49,195.50	$3,338.00	—30,726.51	+21,867.04

*Year Ending June 30th.

The Fairchild & Northeastern Railway Company

An Abandoned Wisconsin Common-Carrier Railroad

Written by ALDEN E. MILLER *for* WILLARD FOSTER, Eau Claire, Wisc.

Willard Foster was two years old when his father, Nathaniel C. Foster, chartered and commenced to build his first railroad. This was in 1878 and the original name of the railroad was the Chicago, Fairchild & Eau Claire River Railroad Company. As W. Foster was too young, by actual experience, to recall the authentic corporate records of his dad's enterprises, and as the CF&ECR RR and its successor, the Fairchild & Northeastern Railway, was a private logging railroad, this company was not within the jurisdiction of any regulatory body, and consequently records concerning these private roads are practically nonexistent. The CF&ECR RR was chartered as a private logging concern but eventually became a common-carrier. Under these circumstances, for lack of accurate records, Jessie D. Foster, wife of Willard, and Mr. Foster admit there may be inaccuracies in chronological tabulation of events or dates, but as personal memory is to be entirely relied upon, the Fosters hope the fellow railroad historians will bear with them.

"As near as I can remember the CF&ECR RR started operating around 1878 but only as a sort of tram road with horse power 'engines'. There were cars with concave wheels which were pulled by horses over wooden rails made from timber cut along the right-of-way. My dad, around 1880, changed the track from wooden rail to 23 pound iron rails and bought a saddle tank locomotive weighing 8 tons and built by H. K. Porter.

"This No. 1 engine was named the *N. C. Foster*, and was shipped to Fairchild, Wis., from the Porter Works, by flatcar.

"Around 1883 or '84 'N. C.' checked over matters and found that a Mr. Foresman had a contract with a large lumber concern in Eau Claire, Wis., to cut 90 million feet of their timber and deliver same. Mr. Foresman was willing to sell his contract to my father who was compelled to take over all of Foresman's equipment which consisted of a H. K. Porter locomotive, the same as my father already had, and about twelve four-wheeled logging cars, tools, etc. Whatever equipment 'N. C.' bought from Foresman was not exactly a compulsory matter for my father already had sufficient equipment needed in his business, but he purchased all of Foresman's rolling stock to 'clean him out entirely'.

"Foresman's Porter locomotive became CF&ECR RR No. 2 and was named the *Flora*. This engine was also shipped to Fairchild on a flatcar, but as it had to be taken up through the woods it was taken down, loaded on wide-wheeled trucks and hauled out to where logging operations were going on and these trucks were pulled by oxen. I do not know when this Porter locomotive was built.

"After the Foresman deal was completed Foster connected his six miles of road with Foresman's seven giving my father thirteen miles of railroad at that time. The Fosters completed that contract and father decided to buy all the white pine timber north of Fairchild and owned

N. C. Foster

Nathaniel C. Foster, President and General Manager Fairchild & Northeastern Ry.

by the Chicago, St. Paul, Minneapolis & Omaha Railroad Company. This timber was all given to the 'Omaha' road under the land grant Act whereby the government had offered alternate sections of timber as payment for building the West Wisconsin Railway, a predecessor of the CStPM&O, thru this part of Wisconsin.

"According to Poor's Manual for 1883 N. C. Foster was Proprietor and Gen'l. Mgr. of the CF&ECR RR. G. A. Foster was Secretary and Ass't. G. M., both with headquarters at Fairchild, Wis. The line then ran from Fairchild to Eau Claire River in Wisconsin, having 13 miles of track (main line) and 6 miles of sidings, etc. Gauge was 4 ft. 8½ in. 25 lb. rail per yard. A private road operated for freight business only, principally logs. Stations: Fairchild, Webb Centre, North Division and Eau Claire River.

"Rolling stock consisted of 3 locomotives, a new saddle back locomotive from the Dickson Works in Scranton, Pa., having been purchased in 1883. One passenger car, 28 box cars and 2 service cars, completed the consist. Operations for the year ending December 31, 1883 shows 75,458 tons of freight moved; 603,664 tons moved one mile. Gross earnings were $12,000; operating expenses $6,000; net earnings $6,000. Milo Burkart was Master Mechanic, located in Fairchild and C. J. Wickersham was Purchasing Agent with principal office in Chicago, Ill.

"By 1885 father decided to log in a big way and he bought a second saddle back locomotive from Scranton, his locomotive No. 3, purchased in 1883, named *Willie* after his son, and No. 4 named the *Gracie May*. These two locomotives each weighed about 16 tons. We kept pushing our railroad through into the timber, in a northeasterly direction from Fairchild, Wis. Much of this timber was small enough to make white pine ties for standard gauge railroads, and some of this was later used on the Fairchild & Mississippi Railway, another enterprise of my dad's.

"On March 27, 1886, articles of incorporation of the Fairchild & Mississippi Ry. Co., were executed by N. C. Foster. A Wisconsin corporation organized to build and operate a line of railroad from Fairchild, Wis., to some point on the line of the Burlington & Northern Railroad (later CB&Q) in Buffalo County, Wis., with a branch line from Fairchild to some point on the line of the Wisconsin Central railroad in Clark or Marathon County, Wis.

"March 29, 1886, the articles of incorporation and patent were issued. Father even went so far as to get blue prints of a bridge which was to cross the Mississippi River at or near Alma, Wis.

"The CF&ECR and the F&M were two distinct railroads, the former running northeast about 30 miles and the latter to be built west from Fairchild. On July 16, 1887 a resolution was filed with the secretary of state of Wisconsin changing the name of the corporation to Sault Ste. Marie and Southwestern Railway Company. This year the line from Fairchild to Osseo, 14.21 miles, was constructed. Father was thinking of building a piece of railroad north through the timber to Sault Ste. Marie, Mich.

"In 1887 Foster got locomotive No. 5 and assigned it to the SSM&SW Ry. This engine was bought from some road in the East and was a Rhode Island engine, 4-4-0 type. It had about a 6 ft. drive wheel

and a 14 inch cylinder. There were no brakes of any kind on this engine except the tank brake, and the only way to stop it, excepting through the use of the tank brake, was to throw her over and 'slug her.'

"In 1889 the SSM&SW line from Osseo to Eleva, 12.89 miles, was constructed.

"By 1890 the CF&ECR RR bought a second-hand locomotive as also did the SSM&SW Ry, Foster's No. 6 and No. 7 locomotives, respectively. No. 6 was a Hinkley built engine, purchased from the Chicago & North Western RR. On the C&NW this Hinkley, built in 1865 was No. 144, named the *Mississippi* a 4-4-0 type. The date of transfer from C&NW No. 144 to SSM&SW No. 6 was March 21, 1890. The No. 6 had 15x24 inch cylinders, had 54 inch drivers, boiler diameter 44 inches, made of copper, and burned wood. Hinkley, Williams & Co., Boston, builders. W. A. Scott, an engineer on the C&NW's Elroy-Winona line, was assigned to this locomotive before it was sold to the SSM&SW. Scott later became General Manager of the CStPM&O.

"Locomotive No. 7 came from the CStPM&O in 1890 and was their No. 211, a 4-4-0 Taunton, built July, 1870, their construction number 501. Originally St. Paul & Sioux City (a predecessor of the CStPM&O) No. 11, no name, was sold to N. C. Foster. It had 14x24 inch cylinders and 54 inch drivers. The No. 7 was all brass-bound, and with no air brake. After it was paid for 'N. C.' got the 'Omaha' to put it through their St. Paul shops and had it equipped with straight air, the old-fashioned long stroke 6 inch air pump. This locomotive had the water pump on the right side and injector on the left, as did the other standard locomotives owned by my father up to this time.

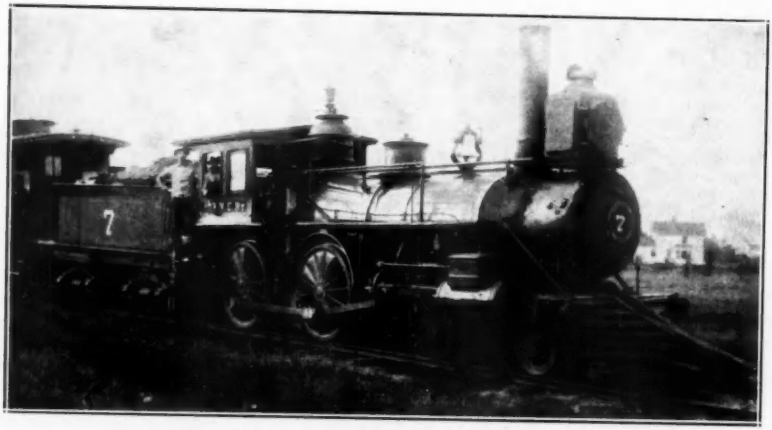
"In this same year, 1890, the line from Eleva to Mondovi, 9.65 miles, was constructed. Father never carried out his plans to continue the line to Alma, Wis.

"As of Nov. 1, 1890, the SSM&SW Company executed to the Farmers Loan & Trust Co., a trust deed, conveying its railroad from Fairchild to Mondovi, Wis., and all property, franchises, immunities, etc., then owned or which might thereafter be acquired by it in connection with said railway. The bonds secured by this trust deed matured Nov. 1, 1915.

"This SSM&SW road, from Mondovi west, was never built and the 37 miles of road from Fairchild to Mondovi were sold, in 1891, to the CStPM&O as a feeder for their line. There was no logging along this branch and it was used as a strictly commercial line. Our rail equipment on this branch was 40 lb. rail, white pine ties, two locomotives—the No. 5 and No. 6, two coaches and five box cars, all equipped with link and pin couplings and no air. The CStPM&O offered to resell to N. C. Foster the No. 5, which it temporarily asisgned it No. 183, and the oldest of the coaches, many years old at that time having been bought from the Boston & Lowell Ry. Father paid the 'Omaha' $1,000 for this coach and engine, and they were to turn down the badly worn tires on the drivers of No. 5.

"Locomotive No. 6 was retained by the CStPM&O and became their No. 184. (No. 184 was removed from the 'Omaha's' equipment list as of Feb. 1909 and scrapped June, 1909). After selling the Mondovi line

C. F. & U. E. "Gracie May." Dickson.



F. & N. E. No. 7. Taunton. Ex. C. St. P. M. & O. No. 211

father decided to build a piece of road through a rich agricultural district to connect with the Chicago, Milwaukee & St. Paul Railway (later CMStP&P) at Caryville, Wis., a distance of about 40 or 45 miles from Fairchild, northwesterly.

"As of 1893 the SSM&SW Ry Company was officially conveyed to the CStPM&O Ry Co., all of the railroad and other property of that company, including all its rights, privileges, franchises and immunities.

"While the CF&ECR RR was advancing northeasterly thru the timber region, an interesting thing happened in the building of this line. We were extending our line into Greenwood, Wis., and had a 110 ft. span steel bridge erected over the Black River at Greenwood. Our track was built over it and on up the right-of-way nearly into Greenwood. The grading was all done and we were to lay the track up to the depot which had been built at the time, on a Monday morning. We would connect with the old Wisconsin Central (later Soo) in building this short piece of track. The WC Ry sent a crew, engine and roadmaster with his track men, and were building a track over our right-of-way to get in ahead of us. But a good friend from Greenwood telephoned my father, and dad called me to get out the *Willie,* pick up all the men I could get in town, stop at the logging camps, and get all the men there and get to Greenwood as fast as I could, and find out what was being done, if necessary prevent anything being done that would jeopardize our property in any way. When I got there they had built about 100 ft. of track across our grade, and we proceeded to tear it up, that is, remove three 30 foot rails and throw them back on their right-of-way with their engine on the wrong side. It being Sunday and every one in Greenwood on our side, there was no warrant made out against us. In the meantime father had come out in the *Gracie.* The WC Ry roadmaster wanted to know how they were going to get water for their engine, so father told them that he would lay the track back for them if they would promise to keep right on going. They promised, and father let them out, and this was the last we saw of the WC crew. The WC roadmaster said he was ordered to go in and do what he had done, but that he was willing to quit. And as it was dark and supper time, the men were all glad to get away. Principal railroad stops from Fairchild to Greenwood were Mentor, Tioga and Owego.

"In 1893 the CF&ECR RR operated one passenger train daily, leaving Fairchild at 6:00 a. m., due at Eau Claire River at 8:00 a. m. Returning at 4:00 p. m. and arriving Fairchild at 6:00 p. m.

"By 1897 I (Willard Foster) assumed supervision of the CF&ECR RR. (Differing with Mr. Foster's assumption SSM&SW locomotive No. 5, bought by the CStPM&O in 1891, was resold to N. C. Foster that same year, your compiler finds from the records of the CStPM&O motive power department, that this No. 5, known as 'Omaha' No. 183, was resold to Foster of Fairchild, Wis., in 1897, and these same records also indicate this engine was an 1869 Taunton, not Rhode Island, as W. Foster believes. Your compiler is ready to admit the CStPM&O motive power clerk may have made a mistake in copying a record of this locomotive into the folio).

"We afterward sold the No. 5 to a northern Wisconsin logging concern at Wausaukee, Wis.

"In 1898 the name of the Chicago, Fairchild & Eau Claire River Railway Company was changed to 'Fairchild & Northeastern Railway Company'.

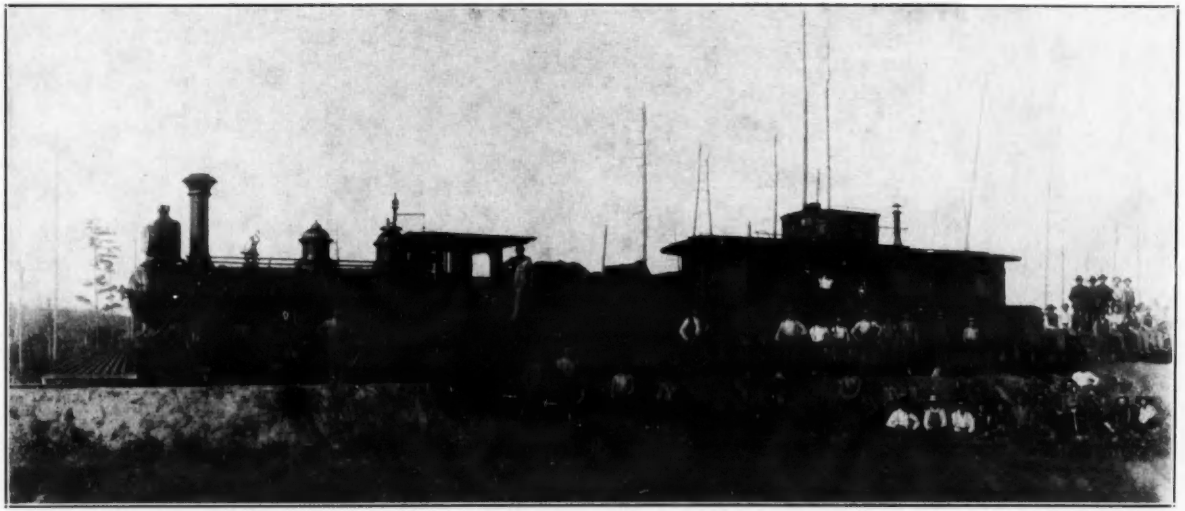
"CStPM&O locomotive No. 231, class C-7, 4-4-0 type, built Feb. 1876 by Taunton, their construction number 669, originally St. Paul & Sioux City RR (later CStPM&O) No. 31, was sold to N. C. Foster, Fairchild, Wis., in 1898, and changed to F&NE Ry No. 8. StP&SC RR No. 31 was named the *W. H. Brown*, and had 16x24 inch cylinders and 54 inch drivers.

"CStPM&O Ry locomotive No. 257 came to the F&NE Ry in an indirect manner. A 4-4-0 type Taunton, built in Aug. 1880, their construction number 747, originally St. Paul & Sioux City RR (later CStPM&O) No. 57, was sold to F. Weyerhauser, Nebagamon, Wis., in 1898. W. Foster, Superintendent of the F&NE Ry then, acquired this engine from the Weyerhauser Company, either that same year, or shortly after. While in Weyerhauser service this Taunton went through a bridge, with three cars of logs coming down on top of it cleaning off all identification marks. It became F&NE No. 9. StP&SC RR No. 57 had 16x24 inch cylinders and 60 inch drivers. The No. 8 was completely overhauled in the 'Omaha' shops before being sold to the F&NE. The No. 9 was also given a complete overhauling in the Weyerhauser shops before turned over to W. Foster.

"F&NE locomotive No. 10 came from the Minneapolis, St. Paul & Sault Ste. Marie R. R. and was their No. 2016. This engine was originally Wisconsin Central No. 74 before the 'Soo' took that road over in 1909. It was a Schenectady built engine of 1885 date, their construction number 2086, a 4-4-0 type. (It is assumed W. Foster purchased this engine between 1909 and 1914, for the exact year is not recalled).

"In 1914 father ordered two locomotives, one from the Lima Works in Lima, Ohio, and the other from the Vulcan Loco Works of Wilkes-Barre, Pa. The Lima rod-connected engine with Walschaert valve gear, became our No. 11, and the Vulcan, an exact duplicate, became our No. 12. Both locomotives were up to date in every way. Father wanted both locomotives as near alike as possible, as he wanted to see which one of the two engine manufacturers could build the best locomotives. About the only difference was that the Lima carried 175 lbs. of steam and the Vulcan 200 lbs.

"The government placed a valuation of $800,000 on the F&NE Ry as of 1916 prices. By 1917 the Fosters had built about 30 miles of their Fairchild-Caryville line, when war with Germany was declared, so the stretch between Cleghorn and Caryville was never built. Stations were Richard, Otter Creek and Emmet. In 1918 the F&NE scrapped their No. 7 locomotive. The F&NE was the shortest railroad in the United States to be taken over by the Railroad Administration during the world war. On account of my father's failing health at this time I was put in full charge of the whole operation of the road, being made general superintendent although the CStPM&O, during the reign of the U. S. R. A., actually operated the road.



S. S. M. & S. W. No. 6, Ex C. & N. W. No. 144, Hinkley, 1865. Shown here as C. St. P. M. & O. No. 184 on construction train out of Elroy, Wis.

"The government gave the road back to us on March 1, 1919 and as I had decided that it would be impossible for us to continue operating it because of its deplorable condition, it was then taken over by some business men of Chicago, and they gave it back in the fall of that same year, 1919. I absolutely refused to operate the F&NE after the government returned the railroads to their owners, because of the dilapidated condition of equipment and finances. I knew we could not operate and pay standard wages demanded by the government.

"When the Fosters decided that they would not operate after the war was over, some business men along the Fairchild-Cleghorn line wished to have this last piece of line to operate for their own convenience in hauling lumber, lime, coal, etc., in, and to haul hay, grain, cattle, etc., out. So I made an arrangement to lease them a locomotive and cars, but as I explained to them that I could not lease the coach—for by hauling passengers they might do something which would make the railroad a common carrier, and that I did not want—so they would bill everything hauled over the railroad, to themselves at Fairchild, and then rebill everything to its final destination. Everything went along fine for about three months, and then they were ready to acknowledge that they knew very little about operating a railroad, and it was completely shut down.

"In 1925 the F&NE Ry was sold to parties in Chicago who thought they could make a 'go' of it. They bought it in January, 1925. Dick Jones headed the Chicago group interested in this purchase.

"I really had supervision of the F&NE from 1897 till it was sold in 1925. Father furnished all of the money and I distributed it as best I could for the railroad's best advantage. The entire stock of the F&NE was owned by N. C. Foster and his immediate family, and there was never a debt against it. This road had the unique standing of being the only modern railroad that we had heard of at that time, of being entirely owned and paid for by one man, and with no indebtedness against it.

"At the time the Fosters relinquished control of the F&NE in 1919, before buying it back three months later, and before the Fairchild-Cleghorn branch was abandoned, the line was 65 miles in length, extending from Cleghorn to Owen, Wis.

"CStPM&O locomotive No. 128, class E-6, a 4-4-0 type built by Schenectady in March, 1886, their construction number 2054, was removed from the 'Omaha's' equipment list as of Sept. 1927 at St. Paul, Minn., and sold to the Chicago business men who then owned the F&NE Ry. This purchase at Fairchild, Wis., as of Dec. 1927, becoming F&NE No. 13.

"When we sold the F&NE in Jan. 1925 we were offered $80,000 by these Chicago business men and accepted same. They operated the road for about three years, and in 1928 scrapped everything except the two newer locomotives, No. 11 and No. 12, which went to some logging road in the south. The abandonment by the Chicago party was the final doom of the Fairchild & North Eastern Railway".

Locomotive Roster—N. C. Foster Company, Fairchild, Wis.—1878-1928.

No.	Name	Builder	Date	Type	Const. No.	Remarks	
1.	N. C. Foster	H. K. Porter	1878	0-4-2T		CF&ECR	# 1
2.	Flora	H. K. Porter	187?	0-4-2T		CF&ECR	# 2 Acq. from Foresman
3.	Willie	Dickson-Scranton	1883	0-6-2T		CF&ECR	# 3
4.	Gracie May	Dickson-Scranton	1885	0-6-2T		CF&ECR	# 4
5.		Rhode Island	1869	4-4-0		SSM&SW	# 5 Acq. from East
6.		Hinkley	1865	4-4-0		SSM&SW	# 6 Acq. from C&NW
7.		Taunton	1870	4-4-0	501	CF&ECR	# 7 Acq. from CStPM&O
8.		Taunton	1876	4-4-0	669	F&NE	# 8 Acq. from CStPM&O
9.		Taunton	1880	4-4-0	747	F&NE	# 9 Acq. from W'yer'ser
10.		Schenectady	1885	4-4-0	2086	F&NE	#10 Acq. from MStP&SSM
11.		Lima	1914	2-6-0		F&NE	#11
12.		Vulcan	1914	2-6-0		F&NE	#12
13.		Schenectady	1886	4-4-0	2054	F&NE	#13 Acq. from CStPM&O

The author wishes to express his thanks to Mr. Foster for the loan of the photographs that accompanied this article.

Log Train Leaving Greenwood, Wisconsin for Fairchild, Wis. F. & N. E. R. R. No. 8

Locomotives of the New Haven Railroad

By Chas. E. Fisher

In 1904, the New Haven owned very close to one thousand locomotives, representing the product of eleven different builders, not including the product of nine railroad shops of their own or leased lines. The task of arranging a series of numbers based on the wheel arrangement, size of cylinders, diameter of drivers and weight of engine was no small one but the renumbering of 1904 has stood the test of time of over thirty years.

In concluding the 1904 series, the construction number will be given only for the new engines as it has already been given under the original locomotive number. The former locomotive number, however, will be indicated.

1200-1209	A-3	Rhode Island	1902	20x26"	78"	135000	Ex 541-550
1210-1214	A-3	Schenectady	1900				536-540
1250-1264	A-1	Rhode Island	1903	20x24"	73"	131000	862-876
1265-1284	A-1	Schenectady	1896				401-420

About fifteen years ago many of these locomotives were rebuilt, superheaters and outside valve gears applied. All but 10 of these engines have been scrapped.

1300-1349	I-2	Brooks	1913	53371-420	24x28"	73"	251500
1350-1399	I-4	Schenectady	1916	56104-153	26x26"	79"	266000
1400-1409	I-5	Baldwin	1937	61964-973	22x30"	80"	365300

The steadily increasing number and size of trains caused the New Haven to purchase the first group of Pacific type locomotives. These I-2 engines did satisfactory service on Shore Line trains and in later years have been used for lighter trains and even fast freight service.

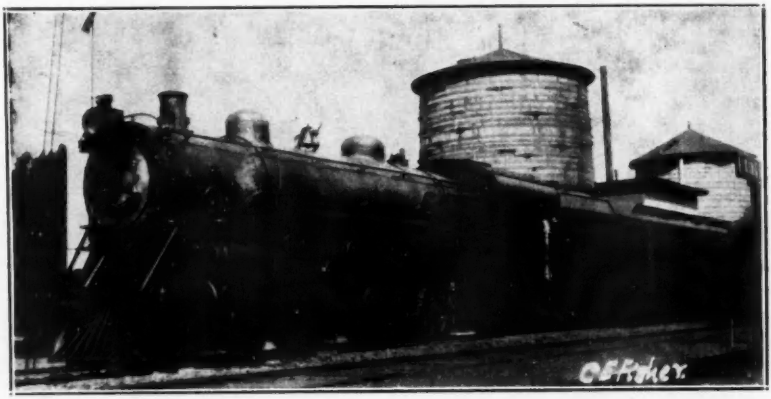
Probably no group of engines on the New Haven have the mileage credited to them that the I-4 class has. In more recent years they have been equipped with feed water heaters, type "E" superheater, syphons and all have had their cylinders bushed to 25" diameter; some have had new fireboxes. These engines have been used on practically all parts of the New Haven R. R.

Nos. 1400-1409 are the new "Hudson" type locomotives and are used on the heaviest Shore Line trains.

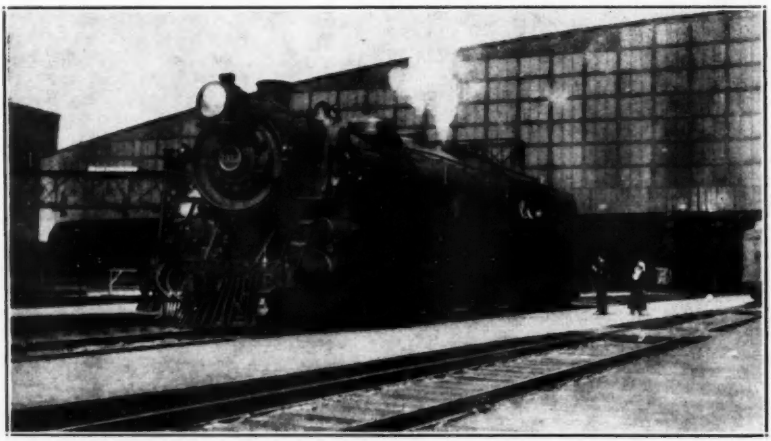
1400-1405	B-4	Baldwin	1888	19x24"	69"	122000	Ex 144-149
1406-1409		Vacant					
1410	B-1	Schenectady	1897	19x24"	73"	122000	902
1411-1413	B-3	Rogers	1892	19x24"	69"	110000	504-506
1414	B-2	New Haven Shop	1893	19x24"	69"	110000	78
1415-1422	B-2	Rhode Island	1892				227-234
1423-1499		Vacant					
1500-1502	C-15	Baldwin	1904	18x26"	69"	122000	905,928,932
1503-1505	C-15	Norwood Shop	1903				314,961,970
1506-1507	C-15	New Haven Shop	1903				26,490
1508	C-15	New Haven Shop	1902				114
1509-1511	C-15	New Haven Shop	1901				6,28,33
1512-1514	C-15	Norwood Shop	1901				936,955,964

Nos. 1504 and 1506 were sent over to the C. N. E. where they ran as 45 and 46, returning to the New Haven under their old numbers in 1927.

1515-1524		Vacant						
1525-1549	C-3c	Rhode Island	1903	18x24"	69"	113000	Formerly Nos. 605,608, 612,617,622,625,628-629,647,667,669,671-672,674,676-677,680-682, 685-686,703-704,707,758	
1550-1558		Vacant						
1559-1569	C-15a	Rhode Island but not in sequence.	1893	18x26"	69"	126000	Ex	241-250
1570-1574	C-15a	Rhode Island	1893					251-255
1575-1577	C-3b	Roxbury Shop	1903	18x24"	69"	107000		700,776,783
1578-1580	C-3b	Roxbury Shop	1902					321,696,791
1581-1582	C-3b	Roxbury Shop	1901					792,822
1583-1586	C-3b	S. Boston Shop	1901					631,636-637,662
1587-1588	C-3b	S. Boston Shop	1900					626,790
1589-1593	C-3b	S. Boston Shop	1899					312,361,618,627 638
1594-1597	C-3b	Roxbury Shop	1899					678,705,761,784
1598	C-3b	S. Boston Shop	1899					786
1599	C-3b	S. Boston Shop	1898					654
1600-1609		Vacant						
1610-1613	C-3a	New Haven Shop	1900	18x24"	69"	107000		7,11,29,31
1614-1617	C-3a	New Haven Shop	1899					37,45-46,95
1618-1621	C-3a	New Haven Shop	1898					34,49,103,105
1622-1623	C3a	New Haven Shop	1897					107,122
1624-1629		Vacant						
1630-1631	C-16	Mason	1886	18x26"	63"	109000		644,666
1632	C-22	O C R R	1893	18x26"	69"	110000		861
1633-1636	C-10	Cooke	1890	18x24"	63"	103000		1066-1069
1637-1639		Vacant						
1640-1649	C1a	Rhode Island	1891	18½x24"	69"	105000		210-219
1650	C-1b	O C R R	1891	18½x24"	69"	100000		832
1651-1652	C-4a	Rogers	1890	18x24"	69"	105000		489,502
1653-1655	C-4b	Rogers	1892	18x24"	69"	105000		1081-1083
1656	C-5	Rhode Island	1890	18x24"	73"	104000		348
1657	C-5	Rhode Island	1882	18x24"	69"	104000		332
1658	C-2	S. Boston Shop	1895	18x24"	69"	99000		710
1659-1661	C-2	O C R R	1893					858,856,857
1662-1666	C-2	Manchester	1893					849,853
1667-1676	C-2	Manchester	1892					839-848
1677-1678	C-2	O C R R	1892					854-855
1679-1680	C-2	O C R R	1892					837-838
1681-1684	C-2	O C R R	1891					833-836
1685	C-2	Rhode Island	1890					358
1686-1687	C-2	O C R R	1890					828-829
1688-1691	C-2	O C R R	1889					745-748
1692	C-2	O C R R	1889					752
1693-1695	C-2	Taunton L W	1888					749-751
1696	C-2	Rhode Island	1888					769
1697	C-2	Rhode Island	1887					340
1698-1699	C-2	O C R R	1887					736-737
1700-1701	C-2	O C R R	1886					732-733
1702	C-2	Mason	1884					757
1703	C-2	Rhode Island	1883					334
1704	C-2	Rhode Island	1881					755
1705	C-2	Rhode Island	1880					327
1706-1709		Vacant						
1710	C-17	Roxbury Shop	1900	18x26"	63"	109000		716
1711-1712	C-17	S. Boston Shop	1898					652,684
1713	C-17	S. Boston Shop	1897					676
1714	C-17	Roxbury Shop	1897					718
1715	C-17	Taunton L W	1882					717
1716	C-11d	Rhode Island	1890	18x24"	63"	100000		921



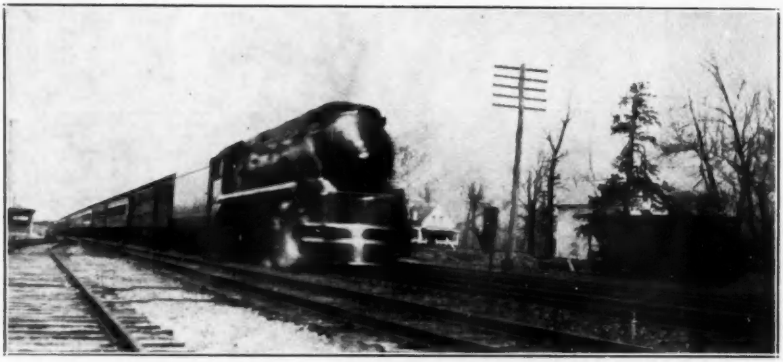
N. H. No. 1348. I-2 Brocks, 1913.



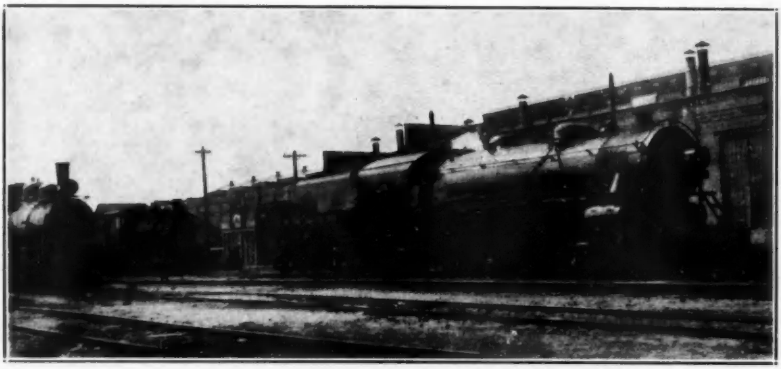
N. H. No. 1353. I-4. Schenectady, 1916. Ready to leave South Station on her maiden trip on the "Knickerbocker Ltd."

1717-1718	C-11d	Grant	1884			104000	Ex	920,950
1719-1720	C-11b	Rogers	1891	18x24"	63"	99000		508-509
1721	C-11b	Rogers	1889					483
1722-1724	C-11b	Rogers	1888					477-478,480
1725-1726	C-11c	Taunton L W	1884	18x24"	63"	103000		725-726
1728-1736	C-11a	Rhode Island	1889	18x24"	63"	97000		200-209
1737-1738	C-18	Taunton L W	1886	18x26"	63"	94000		734-735
1739-1740	C-18	Taunton L W	1885					730-731
1741-1743	C-18	O C R R	1882					645,712-713
1744	C-18	Rhode Island	1880					326
1745	C-18	Rhode Island	1876					388
1746	C-21	Hartford Shop	1891	18x22"	63"	96000		79
1747-1748	C-21	Rogers	1887			88000		475-476
1749	C-6a	Hartford Shop	1891	18x24"	69"	96000		17
1750-1752	C-6b	Rhode Island	1883	18x24"	69"	95000		759,1040-1041
1753	C-12	N Y & N E	1889	18x24"	63"	90000		963
1754	C-12	Hinkley	1887					815
1755	C-12	Manchester	1884					337
1756-1757	C-12	Rhode Island	1882					1004-1005
1758-1759	C-12	Rhode Island	1882					1028-1029
1760	C-12	Rhode Island	1881					360
1761	C-12	Cooke	1877	18x24"	63"	87000		494
1762	C-7	O C R R	1884	18x24"	69"	88000		722
1763	C-7	O C R R	1883					615
1764	C-19b	Rogers	1887	18x22"	69"	92000		199
1765	C-19a	New Haven Shop	1887	18x22"	69"	87000		119
1766-1769	C-19a	New Haven Shop	1886					129,131-133
1770	C-19a	New Haven Shop	1885					21
1771	C-14	Rogers	1886	18x24"	63"	93000		459
1772	C-14	Rogers	1882					472
1773	C-20	Rogers	1886	18x22"	67"	86000		460
1774-1776	C-20	Rogers	1882					176-177,471
1777-1778	C-20	Rogers	1881					473-474
1779	C-13a	New Haven Shop	1874	18x24"	63"	87000		90
1780	C-13a	New Haven Shop	1879					24
1781	C-13a	New Haven Shop	1878					38
1782	C-13a	New Haven Shop	1877					18
1783	C-13a	New Haven Shop	1875					92
1784	C-13a	New Haven Shop	1874					91
1785-1787	C-13b	New Haven Shop	1883	18x24"	63"	87000		120-123
1788-1789	C-13b	New Haven Shop	1882					101,104
1790-1791	C-13b	New Haven Shop	1880					96-97
1792	C-13b	New Haven Shop	1878					26
1793	C-9	Hartford Shop	1884	18x24"	69"	83000		128
1794	C-9	New Haven Shop	1884					127
1795	C-9	New Haven Shop	1882					106
1796	C-9	New Haven Shop	1881					98
1797	C-9	New Haven Shop	1878					22
1798	C-9	Rogers	1875					167
1799		Vacant						
1800	D-7	N Y & N E	1898	17x24"	63"	108000		917
1801	D-7	N Y & N E	1897					962
1802-1803	D-1a	Hartford Shop	1899	17x24"	69"	102000		23,87
1804-1806	D-1a	Hartford Shop	1898					63,94,138
1807-1808	D-1a	Hartford Shop	1887					42,68
1809-1814		Vacant						
1815	D-1b	S. Boston Shop	1899	17x24"	69"	102000		765
1816-1819	D-1b	S. Boston Shop	1898					609-610,650,720
1820	D-1b	Roxbury Shop	1898					797
1821-1824	D-1b	S. Boston Shop	1897					35,43-44,48
1825	D-1b	Rhode Island	1880					800

1826-1829		Vacant						
1830-1831	D-2	Manchester	1891	17x24"	69"	99000	Ex	353-354
1832	D-2	Rhode Island	1882					805
1833	D-2	O C R R	1890					830
1834-1835	D-2	Manchester	1888					342-343
1836-1837	D-2	O C R R	1888					739-740
1838	D-2	O C R R	1887					738
1839-1844		Vacant						
1845	D-8	Rhode Island	1891	17x24"	63"	99000		363
1846-1848	D-8	Hinkley	1889					313,365,400
1849	D-8	Schenectady	1888					151
1850-1851	D-8	Rhode Island	1886					374,377
1852-1853	D-8	Rhode Island	1885					367,373
1854		Vacant						
1855	D-9	N Y & N E	1895	17x24"	63"	96000		924
1856	D-9	Rhode Island	1894					922
1857	D-9	N Y & N E	1894					931
1858	D-9	N Y & N E	1891					925
1859-1860	D-9	N Y & N E	1890					966,969
1861-1865	D-9	N Y & N E	1889					912,914,916,919
								926
1866-1867	D-9	N Y & N E	1888					933,957
1868-1869		Vacant						
1870	D-3a	Roxbury Shop	1894	17x24"	69"	93000		773
1871-1872	D-3a	O C R R	1892					788,799
1873-1874	D-3a	Rhode Island	1887					816-817
1875	D-3a	Taunton L W	1884					810
1876	D-3a	Rhode Island	1881					786
1877-1879		Vacant						
1880	D-3b	Manchester	1890	17x24"	69"	95000		347
1881	D-3b	O C R R	1886					729
1882	D-3b	Taunton L W	1885					673
1883-1884	D-3b	O C R R	1885					727-728
1885	D-3b	Manchester	1884					336
1886	D-10a	Roxbury Shop	1904	17x24"	63"	98000		809
1887	D-10a	Baldwin	1878					937
1888	D-10a	Taunton Shop	1899					708
1889	D-10a	Taunton Shop	1884					642
1890	D-10a	Rhode Island	1880					754
1891-1892	D-10a	Taunton L W	1887	17x24"	63"	90000		741-742
1893-1894	D-10b	Taunton L W	1886					781,811
1895	D-10b	Rhode Island	1886					813
1896	D-10b	Manchester	1885					339
1897	D-10b	Hinkley	1883					721
1898-1899	D-10b	Rhode Island	1883					2,196
1900-1902	D-10b	Rhode Island	1882					183,186,333
1903	D-15	Rogers	1882	17x22"	69"	89000		462
1904	D-15	Hartford Shop	1885					75
1905	D-15	Manchester	1885					338
1906	D-15	O C R R	1883					655
1907	D-15	O C R R	1881					683
1908	D-15	O C R R	1877					653
1909	D-4	Roxbury Shop	1904	17x24"	69"	95000		711
1910	D-4	Rhode Island	1878					756
1911	D-5	Mason	1884	17x24"	69"	80000		611
1912-1913	D-5	O C R R	1880					603,651
1914	D-11	Cooke	1878	17x24"	63"	82000		496
1915	D-11	Cooke	1885					501
1916	D-11	Taunton L W	1884					821
1917-1918	D-11	Rhode Island	1882					803,806
1919	D-11	Rhode Island	1881					767



N. H. No. 1402. I-5. Baldwin, 1937. Westbound "Senator" at Sharon Hts., Mass., 14 cars.



N. H. No. 3007. J-1. Schenectady, 1916.

1920-1922	D-11	Mason	1882				Ex	913,1022-1023
1923-1924	D-11	Taunton L W	1882					1024-1025
1925-1926	D-11	Hinkley	1881					945,952
1927	D-11	Hinkley	1880					142
1928	D-11	Hinkley	1876					140
1929	D-11	Taunton L W	1876					976
1930	D-6	Rhode Island	1881	17x24"	69"	74000		369
1931	D-6	Manchester	1881					330
1932	D-6	Manchester	1876					324
1933	D-12	Rogers	1885	17x24"	63"	77000		187
1934-1935	D-12	Manchester	1881					328-329
1936	D-12	Rhode Island	1881					801
1937	D-12	Manchester	1879					325
1938	D-12	Schenectady	1876					927
1939	D-12	N Y & N E	1876					977
1940	D-12	Hinkley	1875					934
1941	D-13	Rhode Island	1881	17x24"	63"	72000		366
1942	D-13	Hinkley	1880					951
1943	D-13	Hinkley	1878					901
1944	D-13	Baldwin	1878					930
1945	D-13	Rhode Island	1877					117
1945	D-13	Hinkley	1873					929
1947	D-14	Rogers	1872	17x24"	56"	74000		168
1948	D-16	New Haven Shop	1876	17x22"	69"	74000		39
1949	D-16	Cooke	1872					5
1950	D-16	O C R R	1872					642
1951	D-16	New Haven Shop	1871					50
1952	D-17	Rhode Island	1896	17x22"	63"	84000		88
1953	D-17	Rhode Island	1885					373
1954-1999		Vacant						
2000	E-1	S. Boston Shop	1899	16x24"	69"	90000		320
2001	E-1	S. Boston Shop	1898					654
2002	E-1	O C R R	1890					788
2003	E-1	O C R R	1889					688
2004	E-1	Rhode Island	1887					793
2005	E-1	Rhode Island	1881					802
2006	E-2	Rogers	1887	16x24"	69"	80000		188
2007	E-2	Rhode Island	1880					826
2008	E-2	O C R R	1876					668
2009-2010	E-2	O C R R	1873					660-661
2011	E-3	Roxbury Shop	1903	16x24"	69"	80000		774
2012	E-3	O C R R	1879					657
2013	E-3	Rhode Island	1877					764
2014	E-3	Rhode Island	1875					116
2015	E-3	Rhode Island	1874					115
2016	E-3	Manchester	1871					317
2017	E-4	Norwood Shop	1900	16x24"	63"	89000		974
2018-2019	E-4	S. Boston Shop	1898					620,670
2020	E-4	Taunton Shop	1898					691
2021	E-4	Taunton L W	1884					775
2022	E-4	Taunton L W	1883					778
2023	E-5	N Y & N E	1890	16x24"	63"	80000		960
2024	E-5	Taunton L W	1867					633
2025	E-5	Taunton L W	1865					630
2026	E-5	O C R R	1885					724
2027	E-5	Rogers	1885					198
2028	E-5	Rogers	1884					197
2029	E-5	O C R R	1884					723
2030	E-5	O C R R	1881					648
2031	E-5	Rogers	1881					195
2032	E-5	Rhode Island	1880					259

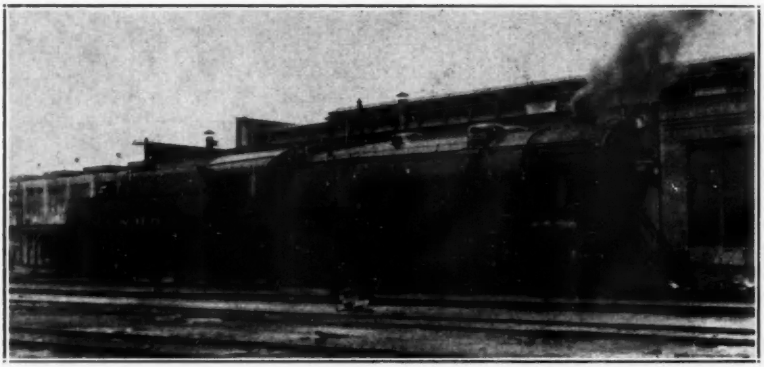
2033	E-6	Rhode Island	1889	16x24"	63"	75000	Ex	1080
2034	E-6	Rhode Island	1882					1079
2035	E-6	O C R R	1874					665
2036	E-6	Rhode Island	1872					702
2037	E-6	Manchester	1871					316
2038	E-7	N Y & N E	1888	16x24"	63"	70000		918
2039	E-7	Mason	1875					709
2040	E-7	O C R R	1872					646
2041	E-8	Cooke	1881	16x24"	56"	70000		500
2042	E-8	Rhode Island	1875					118
2043	E-9	Hartford Shop	1877	16x22"	69"	68000		56
2044	E-9	Rhode Island	1875					113
2045	E-9	Cooke	1872					8
2046	E-10	New Haven Shop	1868	16x24"	63"	74000		80
2047	E-10	Rogers	1881					163
2048	E-10	Rogers	1869					152
2049	E-11	Rogers	1884	15x22"	69"	70000		4
2050	E-12	Rogers	1869	15x22"	63"	67000		161
2051	E-13	Hartford Shop	1870	14x20"	69"	70000		81
2052-2099		Vacant						
2100	Z-1	Mason	1890	16x24"	57"	72000		831
2101	Z-1	Mason	1885					619
2102	Z-1	Mason	1885					827
2103	Z-2	Mason	1887	14x18"	51"	46000		753
2104-2109		Vacant						
2110-2111	S-1	Rhode Island	1887	17x20"	57"	65000		763,814
2112	S-1	Rhode Island	1886					812
2113-2114	S-1	Rhode Island	1885					771,777
2115	S-2	Rhode Island	1888	16x20"	57"	63000		370
2116	S-3	Taunton L W	1885	16x20"	57"	57000		779
2117	S-3	Rhode Island	1884					808
2118-2119	S-4	Rhode Island	1883	16x20"	53"	63000		371-372
2120-2122	S-4	Rhode Island	1882					331,391-392
2123-2124	S-4	Rhode Island	1881					368,390
2125-2127	S-5	Rhode Island	1891	15x20"	57"	68000		355-357
2128	S-6	Rhode Island	1889	15x20"	57"	63000		345
2129	S-6	Rhode Island	1887					341
2130	S-6	Rhode Island	1883					335
2131-2133	S-8	Rhode Island	1892	14x20"	49"	53000		235-237
2134-2140	S-8	Rhode Island	1891					220-226
2141-2299		Vacant						

Needless to say all of the above engines from 1410 upwards have long since been scrapped.

2300-2301	T-1	Rhode Island	1902	20½&31x26"	51"	135800	Ex	456,458
2302-2305	T-1	Rhode Island	1902					465-468
2306	T-1	Rhode Island	1902					491
2307-2309	T-1	Rhode Island	1902					497-499
2310-2317	T-1	Schenectady	1900					441-448
2318	T-1	Schenectady	1900	Renumbered 2324				449
2319	T-1	Schenectady	1900					450
2320-2323		Vacant						
2324	T-1	Schenectady	1900					449&2318

The above engines were rebuilt to 19x26" Class T-2a.

2325-2343	T-2a	Rhode Island	1904	19x26"	51"	132000	Formerly Nos. 305-306,308,310, 315,378,453,455, 493,495,794,820, 825,859-860,877-880.



N. H. No. 3225. L-1. Schenectady, 1918.

N. H. No. 3335. R-1a, Schenectady, 1920. Engine being tested for feed water heater.

2344-2349		Vacant							
2350-2351	T-3	Schenectady	1904	20x24"	51"	120000	Ex	CNE	1-2
2354-2355	T-3	Schenectady	1907					CNE	3-4
2354-2353	T-3	Schenectady	1910					CNE	5-6
2356-2372		Vacant							
2373-2379	T-2b	Rhode Island	1905	37680-686	19x26"	51"	135400		
2380-2394	T-2b	Rhode Island	1905	30922-936					
2395-2399	T-2b	Rhode Island	1905	30994-998					
2400-2401	T-3	Schenectady	1904	Returned to CNE 1-2; 9-1-1905					
2400-2434	T-2b	Rhode Island	1907	42951-985					
2435-2444	T-2b	Cooke	1910	48164-173	19x26"	51"	141000		
2445-2469	T-2b	Cooke	1910	53421-445					
2470-2499		Vacant							
2500-2502	U-1a	Rhode Island	1893	18x24"	51"	92000	Ex	621,643,649	
2503-2506	U-1a	Rhode Island	1892					307,309,614,658	
2507-2511	U-1a	Rhode Island	1891					351-352,604,613 623	
2512-2514	U-1a	Rhode Island	1890					350,1070-1071	
2515-2516	U-1a	Rhode Island	1889					346,375	
2517	U-1b	Rogers	1891	18x24"	51"	96000		510	
2518	U-1b	Rogers	1890					486	
2519	U-1b	Rogers	1889					485	
2520	U-1c	Pittsburgh	1903	18x24"	51"	96500		16	
2521-2522	U-2	Rhode Island	1882	18x24"	51"	86000		1018-1019	
2523	U-3	Norwood Shop	1904	18x24"	45"	94000		3	
2524	U-3	Hartford Shop	1904					166	
2525	U-3	New Haven Shop	1904					170	
2526-2528	U-3	Baldwin	1904					191,193,322	
2529-2530	U-3	Norwood Shop	1904					376,789	
2531-2432	U-3	New Haven Shop	1903					171,178	
2533-2535	U-3	New Haven Shop	1902					136-137,139	
2536	U-3	New Haven Shop	1901					15	
2537-2538	U-3	Schenectady	1898					639,659	
2539	U-3	New Haven Shop	1897					102	
2540	U-3	New Haven Shop	1896					40	
2541	U-3	Hartford Shop	1896					1	
2542-2545	U-3	Rhode Island	1895					454,461,464,469	
2546-2550	U-3	Rhode Island	1894					36,72,76 238-239	
2551-2557	U-3	Rhode Island	1893					12,74,77,134, 164,181,457	
2558-2562	U-3	Rhode Island	1892					61-62,66,70-71	
2563-2594		Vacant							
2595-2596	U-4	Rome	1890	18x24"	45"	90000		54,73	
2597-2599	U-5	Baldwin	1888	18x24"	45"	88000		150,179-180	
2600-2699		Vacant							
2700	V-1	Rhode Island	1871	17x24"	58"	70000		380	
2701-2702	V-2	Taunton L W	1889	17x24"	51"	92000		632,635	
2703-2704	V-2	Taunton L W	1887					743-744	
2705	V-3	N Y & N E	1888	16x24"	51"	88000		907	
2706	V-4	Rogers	1885	16x22"	51"	76200		184	
2707-2708	V-4	Hartford Shop	1884					124,126	
2709	V-4	Hartford Shop	1881					100	
2710	V-5	Hartford Shop	1887	16x22"	45"	68000		59	
2711	V-5	Hartford Shop	1886					130	
2712	V-5	Hartford Shop	1885					58	
2713-2714	V-5	N & W	1882					1002-1003	
2715	V-5	N & W	1881					1076	
2716-2799		Vacant							
2800	X-1	New Haven Shop	1891	18x24"	55"	70000		99	
2801-2802	X-2	Rhode Island	1884	17x24"	51"	76000		394-395	

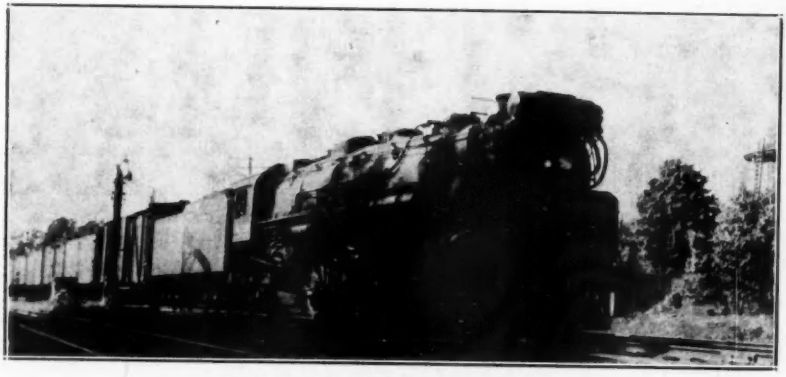
2803	X-4	Taunton L W	1885	17x24"	57"	76000	Ex	824
2804	X-5	Hinkley	1889	16x24"	55"	70000		384
2805	X-5	Taunton L W	1885					607
2806	X-5	Taunton L W	1884					606
2807	X-5	Taunton L W	1883					719
2808-2809	X-6	N & W	1889	16x24"	51"	72000		910,935
2810	X-6	N Y & N E	1889					968
2811	X-6	N Y & N E	1888					958
2812	X-6	N & W	1888					1076
2813-2814	X-6	Rogers	1887					386,396
2815-2817	X-6	N Y & N E	1887					904,947-948
2818	X-6	N Y & N E	1886					949
2819-2820	X-6	N Y & N E	1885					906,909
2821	X-7	Rhode Island	1880	16x24"	53"	61000		362
2822	X-7	N Y & N E	1886					923
2823	X-7	Rhode Island	1881				Ex	389
2824-2825	X-8	Hartford Shop	1899	16x22"	45"	66000		67,135
2826	X-9	Rhode Island	1886	16x20"	51"	65000		14
2827-2899		Vacant						
2900	Y-1	Rhode Island	1888	15x24"	51"	63000		762
2901	Y-1	Manchester	1874			53000		323
2902	Y-1	Rhode Island	1872					382
2903	Y-2	Rogers	1883	15x22"	51"	52000		451
2904	Y-2	O C R R	1883					715
2905	Y-2	O C R R	1882					714
2906	Y-2	Hinkley	1880					908
2907	Y-2	Rhode Island	1879					385
2908	Y-3	Rhode Island	1879	14x24"	51"	58000		807
2909-2910	Y-3	Rhode Island	1873					624,795
2911	Y-3	Rhode Island	1872			46000		318
2912-2913	Y-3	Rhode Island	1871					381,787
2914	Y-6	Taunton L W	1872	12x22"	45"	55000		967
2915	Y-7	New Haven Shop	1875	12x20"	41"	39000		93
2916	Y-7	Hartford Shop	1872					84
2917	Y-7	New Haven Shop	1869					52
2918-2999		Vacant						

Of the above group many of the Class T switchers are still in service but practically all of the others have been scrapped. In the matter of the engines built in the various shops of the company it is difficult at this late day to determine whether they were new engines or the old ones simply reboilered. The data is taken from the 1907 classification and this should be carried in mind in checking back with the dimensions and data as formerly given.

Turning now to the last group of engines, the growing freight traffic on the Shore Line and the importance of the Maybrook gateway has caused a steady purchase of new freight equipment. A group of 2-8-2 type engines were purchased the same year as the I-4 Pacific type. Two years later fifty Santa Fe type engines were purchased. These were assigned the more difficult portions of the road and in more recent years have been equipped with feed water heaters, syphons and the pressure raised on the new sub classes created, to 200 lbs.

In 1919 the U. S. R. A. turned over to the New Haven ten Mountain type engines. The superiority of this wheel arrangement for handling heavy freight trains over the congested Shore Line was readily seen and repeated orders have increased the number to well over fifty. They

N. H. No. 3503. R-2a. Schenectady, 1926. Engine hauling electric motor and 24 cars. Detoured via Stevenson, Ct., on account of trouble on N. Y. Div.



N. H. No. 3553. R-3a Schenectady, 1928.

are used on the Shore Line and faster freights and during the days of heavy passenger movement have easily handled trains of twenty Pullmans to the Worcester gateway. The first group of Mountain types have had feed water heaters applied and the majority are equipped with syphons.

The switching power has been improved by the purchase of a number of 0-8-0 switching engines. The three cylinder switchers are used chiefly at Cedar Hill and Worcester and the others are scattered over the road.

3000-3024	J-1	Schenectady	1916	55696-719	25x30"	63"	251750
3025-3099		Vacant					
3100-3107	J-2	Schenectady	1916	55720-727	26x32"	63"	309600
				Nos. 3105-3107 transferred to C N E as 180-182, returning to New Haven in 1927 under former Nos.			
3108-3199		Vacant					
3200-3240	L-1	Schenectady	1918	57891-940	30x32"	63"	359730
3250-3299		Vacant					
3300-3309	R-1	Richmond	1919	59790-799	27x30"	69"	333280
3310-3339	R-1a	Schenectady	1920	62205-234	27x30"	69"	334000
3340-3348	R-1b	Schenectady	1924	64937-945	27x30"	69"	334000
3349-3399		Vacant					
3400-3409	Y-3	Schenectady	1920	62374-383	25x28"	51"	216000
3410-3414	Y-3	Schenectady	1923	64947-951	25x28"	51"	219000
3415-3419	Y-3	Schenectady	1922	63457-461	25x28"	51"	219000 Ex CNE 28-32
3420-3434	Y-3	Schenectady	1922	63400-414	25x18"	51"	219000 CNE 13-27
3435-3499		Vacant					
3500	R-2	Schenectady	1924	64946	27x30"	69"	360700
3501-3507	R-2a	Schenectady	1926	66545-551	27x30"	69"	363200
3508-3549		Vacant					
3550-3552	R-3	Schenectady	1926	66552-554	(3)22x30"	69"	374700
3553-3562	R-3a	Schenectady	1928	67227-236	(3)22x30"	69"	379700
3563-3599		Vacant					
3600-3609	Y-4	Schenectady	1924	65338-347	(3)22x28"	56"	247000
3610-3615	Y-4a	Schenectady	1927	67394-399	(3)22x28"	56"	247000

The wheel arrangement is indicated by the following letters:

0-4-0	Letters	X and Y	4-6-4	Letters	I-5
0-6-0		T, U and V	2-8-0		P
4-4-0		A, B, C, D and E	2-8-2		J
4-4-2		F now H	2-10-2		L
2-6-0		K, M and N	4-8-2		R
4-6-0		G and H	0-8-0		Y (new engines)
4-6-2		I	2-4-4		S and Z

This concludes the New Haven locomotives commenced in Bulletin No. 40 and which has appeared in Nos. 41, 43, 44, 46, 47, 49 and 50.

Worth Reading

(Compiled by Elizabeth O. Cullen, Reference Librarian, Bureau of Railway Economics, Association of American Railroads, Washington, D. C.)

BOOKS AND PAMPHLETS

Casey Jones; Epic of the American Railroad, by Fred J. Lee. 298 pp. Illustrated. Maps on lining-papers. Kingsport, Tenn., Southern Publishers, Inc. A biography of John Luther Jones, better known by his nickname and a song.

The Cavalcade of the Rails, by Frank P. Morse. 351 pp. Illustrated. New York, E. P. Dutton & Co. A readable history of railroads that is the more readable because it chronicles the efforts of men and a few women to get the railroads extended over the United States.

Pacific Railways and Nationalism in the Canadian-American Northwest, 1845-1873, by Leonard Bertram Irwin. 246 pp. Philadelphia, Penna., University of Pennsylvania. ". . . The Northern Pacific and the Canadian Pacific are today two of the greatest rail systems in North America. Much has been written of their construction, with their vast engineering problems, and of their financial history. Little, however, has been done on the early story of these roads and their very important influence on the political history of the Northwest before the panic of 1873. . . A detailed investigation of the relationship between railways and the early political history of the Northwest remains to be done, and the present narrative is an attempt in this direction . . ." Introduction.

Public Aids to Transportation, by Section of Research, U. S. Federal Coordinator of Transportation. 4 vols. Washington, D. C., U. S. Government Printing Office. "Published after expiration of Emergency Railroad Transportation Act, 1933" [April 1940]. Vol. 1. General Comparative Analysis, and Public Aids to Schedules Air Transportation. Vol. II. Aids to Railroads and Related Subjects [taxation and nonproductive expenditures]. Vol. III. Public Aids to Transportation by Water. Vol. IV. Public Aids to Motor Vehicle Transportation.

Railroad Combination in the Eastern Region. Part 1 (Before 1920); Part 2 (1920-24). Report, by Committee on Interstate Commerce, U. S. Senate, pursuant to S. Res. 71 (74th Congress) authorizing an investigation of railroads, holding companies, and affiliated companies. 2 vols. of 5-volume report, that have been printed so far. Washington, D. C., U. S. Government Printing Office. Issued as 76th Congress, 3d session. Senate Report No. 1182. Part 2 discusses Ripley and Interstate Commerce Commission reports on consolidation of railroads.

A Railroad to the Sea, by Levi O. Leonard and Jack T. Johnson. 277 pp. Front. [portrait of Dr. Thomas C. Durant] Iowa City, Iowa, Midland House, Publishers. "In the history of American transportation a railroad to the sea (a transcontinental system), which appeared on the stage in the middle of the eighteenth century as the dream of John

Plumbe, Jr., of Iowa, came to fulfillment through the dynamic activities of Doctor Thomas C. Durant in the story of the Union Pacific . . ." Introduction by Benj. F. Shambaugh, Superintendent of the State Historical Society of Iowa.

The Railroads of Florida, by Ralph G. Hill and James H. Pledger. [5], 29, 79, [4] pp. Folded charts. Tallahassee, Florida, Florida Railroad Commission in conjunction and with the assistance of, Works Progress Administration, Official Project No. 665-35-3-68. "Every railroad which has ever been incorporated or chartered in the State of Florida is listed, and the more pertinent corporate facts are noted . . ." p. [2].

Railway Freight Traffic Trends (Potential and Actual), by Bureau of Railway Economics, Association of American Railroads. 11 pp. Washington, D. C., The Bureau. Dated February 1940. "Comparison of Trends" pp. 6-9.

A Review of Railway Operations in 1939, by Julius H. Parmelee. 38 pp. Washington, D. C., Bureau of Railway Economics, Association of American Railroads. "(Reprinted by permission from Railway Age for January 6, 1940, and figures revised to March 25, 1940)".

The Rise of Railroads in the Connecticut River Valley, by Thelma M. Kistler. 289 pp. Map: Principal Railroads of New England, 1860. Northampton, Mass., Smith College Department of History.

Russian Railway Developments, by Railway Research Service, 18, 3 typed pp. London, England, Railway Research Service. Dated February 15, 1940. "This paper attempts to summarize the more recent developments on the U. S. S. R. railways . . . Of major interest at the present juncture is the capacity of railway systems concerned for passing through traffic from European and Asiatic Russia to the enlarged territories of the Reich . . ." p. 1.

Sectionalism and Internal Improvements in Tennessee, 1796-1845, by Stanley John Folmsbee. 293 pp. Folded map: Tennessee 1840—Railroads Completed or Under Construction; Philadelphia, Penna., University of Pennsylvania. ". . . The state of Virginia, early in 1831, chartered the Lynchburg and New River Railroad . . . The extent to which interest was aroused in favor of this project throughout East Tennessee is indicated by the fact that it resulted in the publication for one year at the little village of Rogersville, Tenn., of the first American newspaper to be published primarily in the interest of railroad construction . . . the RAIL-ROAD ADVOCATE . . ." pp. 88-89.

The Visit of Their Britannic Majesties to the United States of America—Itinerary—June 7 to June 12, 1939. [18] pp. including Map: Route of the Royal Train in the United States of America. Published jointly by The Delaware & Hudson Railroad Corporation, The New York Central Railroad Company, The New York, New Haven & Hartford Railroad Company, and The Pennsylvania Railroad Company.

ARTICLES IN PERIODICALS

Another Side of Lincoln, by Albert R. Beatty. National Republic, March 1940, pp. 1-2, 19, 32. Illustrated. ". . . a little known side . . . that of attorney and friend of the railroads . . ." p. 1.

The Combustion Turbine Locomotive, by J. T. Rettaliata. New York Railroad Club Official Proceedings, January 18, 1940, pp. 60-83. Discussion pp. 84-90.

The Empirical Forecasting of Railway Traffic, by C. Douglas Campbell. Journal of the Institute of Transport, March 1940, pp. 75-82. "The word 'forecasting' is apt nowadays to conjure up visions of 'Olde Moore' . . . In fact, the word has become hardly respectable. It is the purpose of this article to deal with a much more reputable art, that of being able to indicate in advance and with an impressive degree of accuracy, the changes which take place in railway traffic as a result of variations in economic activity . . . Throughout it will be assumed that peace, not war, conditions prevail . . ." p. 75.

High Lights of Pending Railroad Legislation, by R. V. Fletcher. New York Railroad Club Official Proceedings, February 15, 1940, pp. 99-113. ". . . We are now to have, I believe, a Transportation Act of 1940 . . ." p. 99.

The Medical Side of the Railroad Industry and Its Management, by Dr. Harvey Battle. Railway Club of Pittsburgh Official Proceedings, January 25, 1940, pp. 34-43. Discussion pp. 43-45.

Passenger Progress Number. Railway Age, October 14, 1939. Illustrated. "Five and a Half Years of the Streamliners"—Editorial comment pp. 551-552. "Passenger Progress Almanac, 1934-1939" pp. 557-558. "Statistics Prove Success of the Streamliners" pp. 559-577, with "Index of Trains" p. 559.

The Rail-Road Advocate, Rogersville, Tenn., Vol. 1, No. 1, July 4, 1831—No. 26, June 14, 1832—Microfilm and Photoprints made and deposited as ADI Document No. 1335, March 13, 1940, by American Documentation Institute, Washington, D. C. Foreword by R. H. Johnston, Librarian, Bureau of Railway Economics Library, which has one of the two complete files of this first American periodical devoted to railroads. The other file is in Virginia State Library at Richmond. With the Microfilm copy and a reading machine handy, railroad developments of the 1830s, and other events that were then current, including the "Polish War", can be traced by anyone interested, anywhere now.

Railroads on the Witness Stand, by Burton K. Wheeler. Survey Graphic, March 1940, pp. 149-151, 201-203. "A prescription for ailing railroads, written after four years of intensive diagnosis by the Senate railroad investigation . . ." Editorial summary, p. 149.

Railway-Car Engineering, by D. S. Ellis. Mechanical Engineering, January 1940, pp. 18-22. Contributed by Railroad Division, A. S. M. E. to annual meeting. ". . . In so far as passenger equipment is concerned, alloy steels . . . will continue to be used for new passenger equipment . . . The developments which have occurred in freight-car construction may or may not represent the ultimate possibilities in practical lightweight design . . ." Conclusion, p. 22.

Steam-Electric Locomotives, by C. M. Davis. Southern & Southwestern Railway Club Proceedings, January 1940, pp. 8-19. Discussion pp. 19-24.

Transport Services and the War. [*1*]—Railway Gazette, September 8, 1939, pp. 358-360—A weekly summary of events throughout Europe. The latest received when this list was compiled is No. 30 in issue of March 22, 1940, pp. 422-424. Some include maps, and reproductions of British Ministry of Transport and other posters. An atlas and the latest available maps of Europe at the moment are useful to have for reference when reading this series. "Poland and Mass Migrations" in the March 22, 1940 issue, and the "Polish War" events in Rail-Road Advocate in 1831-1832, listed above, provide certain grim similarities in history.

Vers le Texas, by Monsignor Olivier Maurault. Revue Trimestrielle Canadienne, March 1940, pp. 1-26. To make the Baccalaureate address at Rice Institute, Houston, Texas, Monsignor Maurault travelled from Montreal, Canada . . . " a mere bagatelle of 4,567 miles to make an address 45 minutes long". His account of trains, country traversed, stations, and other details make lively, interesting reading.

New Books

THE BALTIMORE AND OHIO IN THE CIVIL WAR, by Festus P. Summers, 304 pages, 8⅝x5½, illustrated. Bound in cloth. Published by G. P. Putnam's Sons, New York, N. Y. Price $3.00.

The author of this book has given an excellent account of this railroad during the four years of civil strife. As a Maryland corporation it had to bow to the wishes of that state. Traversing the state of Virginia, the road came under the domination of that state but finally the importance of the road to the Union and, incidentally the mines that supplied the U. S. Navy with coal were located on the road, caused the Federal forces to try and keep it open at all costs.

Over fifty battles were fought near its line, time and again tracks and equipment were destroyed but always the road was rebuilt, the equipment repaired and the road started anew. Truly the railroad forces must have become experts at the end of the struggle.

Perhaps the most interesting chapter is the account of the transportation of 20,000 troops from General Meade's army to the relief of Rosecrans at Bridgeport, Tennessee. This was the first time that the railroad demonstrated its efficiency to carry a large troop movement. It took careful planning, conditions were not the same as today but in 9½ days the Eleventh and Twelfth Corps of the Army of the Potomac, under the command of General Hooker, had been safely transported a distance of 1200 miles.

The author has presented a wealth of material and has presented it in a very fair manner. The relationship between the railroad and the state of Virginia is a new angle. The book is not a memorial to dead heroes but a tribute to the staunchness and energy of the road and its men.

WHISTLER'S FATHER, by Albert Parry, 368 pages, 9x6, illustrated. Bound in cloth. Published by The Bobbs-Merrill Co., Indianapolis, Indiana. Price $3.50.

This book is an account of the experiences of George Washington Whistler and his family while the "father" was engaged in building the railroad between St. Petersburg and Moscow for the Tsar Nicholas I. Here we have barbaric Russia of the 1840's with its serf system and its corruption and graft of the Tsar's retainers. That Whistler was able to build the railroad at all, under those conditions, merits our praise for his engineering skill and ability. The construction of the locomotives and rolling stock is another.

The book is about evenly divided between Whistler's work for the Tsar and the experiences of his family and their friends in that strange land. One might wish that the author did not stress so frequently the piousness of his wife, Anna, making her appear almost ridiculous. James McNeill Whistler, the artist, son of George Washington Whistler was a boy during this sojourn in Russia and here he commenced his study of art.

Major Whistler died of cholera before his task was completed. In addition to his own life, this task cost him the lives of two of his sons.

The author has presented a most interesting account of the experiences of this famous American and his family in that distant country.

To those of us who expected an autobiography of Major Whistler, we are doomed to disappointment. This book treats of his experiences in Russia. His residence in Lowell, his work with the Locks & Canals Co., the building of the Stonington road and lastly, the work for which he will always be famed, the construction of the Western (Massachusetts) R. R., are simply mentioned. Some day, we hope some author will complete his autobiography and treat of this work as carefully as Mr. Parry has treated his experiences in Russia.

ORGANIZATION AND TRAFFIC OF THE ILLINOIS CENTRAL SYSTEM, by various authors, 526 pages, 9x6, illustrated. Bound in cloth. Published by the Illinois Central R. R. Price $2.00.

This book is a carefully prepared study of the functions of a great railroad system. Fifty officials, representing the Traffic, Operating, Accounting, Purchasing, Law, Engineering and Public Relations departments have all co-operated with their contributions to make this work a success. Each chapter covers in no little detail some particular phase of the work of this railroad. The book is a great storehouse of how a modern railroad is operated. The price quoted is a special offer made to our members as long as the small surplus stock of books lasts. Orders should be addressed to Mr. J. R. Sullivan, Research & Development Bureau, Illinois Central System, 135 East 11th Place, Chicago, Illinois.

HIGHLINERS, by Lucius Beebe, 103 pages, 8x11, illustrated. Bound in cloth. Published by D. Appleton-Century Co., New York, N. Y. Price $5.00.

Our member, Lucius Beebe, has again acquitted himself nobly in preparing this interesting album of train photography. The book is of a size that permits the best possible use of train photography. The remarks accompanying each photograph are of such a nature as will convey the maximum amount of data in briefest form. They are descriptively excellent. As for the reproductions, the work of Mr. Beebe needs no introduction here. He has surpassed his former work—"High Iron" and preserved for future generations the thunder and smell of soft coal smoke of the steam train of today. To anyone who wants an album of what our railroads are doing in the matter of train operation, let him own a copy of this book.

HISTORY OF THE ST. JOHNSBURY & LAKE CHAMPLAIN RAILROAD, by John S. Kendall, 28 pages, 9x6, illustrated. Paper covers. Published by John S. Kendall, c/o Post Office Department, St. Johnsbury, Vt. Price 35c.

Our member, Mr. Kendall, has traced here the vicissitudes of this railroad in Northern Vermont. Born with the optimism that it would be a great trunk line extending from Portland to the Great Lakes, its financial difficulties and enemies within the Vermont borders prevented its completion. The eastern end of the line became part of the Maine Central, the western end, known as the St. J. & L. C. Under Boston & Lowell and Boston & Maine control the road was put on its own in 1924

and continues as such today. The author has given an interesting account of this road and the part it played in that section of his state. There are several interesting photographs and two locomotive rosters—one under the B & L—B & M management and one dated November, 1939.

Samuel Mathews Vauclain

Samuel M. Vauclain, chairman of the board of the Baldwin Locomotive Works since 1929 and associated with that concern since 1883, died of heart trouble at his home in Rosemont, Pa., on February 4th last at 83 years of age.

Mr. Vauclain was born in Philadelphia, Pa., on May 18, 1856. His father had been in the employ of Matthias W. Baldwin and the Philadelphia and Reading R. R. Upon entering the service of the Pennsylvania R. R., he was transferred to Altoona, Pa. Here young Samuel received his education in the Altoona public schools and here, at the age of 16, he entered the employ of the Pennsylvania R. R. At the age of 21 he completed his apprentice training and was made foreman of the frame shop. In 1882 he was sent to the Baldwin Works to inspect the construction of some locomotives for the Pennsylvania R. R. He was offered a position with the Baldwin Works and on July 1, 1883 he accepted and was made superintendent of the Seventeenth Street Shops.

In 1886 he was made general superintendent of the plant and in 1896 he became a member of the firm—Burnham, Williams & Co., proprietors of the works. In 1911 he was made vice president of The Baldwin Locomotive Works, the company having been incorporated in 1909 and in 1919 he was made president of the company. Ten years later he relinquished the presidency and was made chairman of the board.

His efforts during the World War were untiring and the Baldwin Works completed large orders for locomotives, ammunition cases and gunmounts. His services rendered to his own and to foreign governments were recognized by many of the highest medals and our own colleges and universities conferred on him their honorary degrees.

During the 57 years he was associated with the Baldwin Works, he saw the first "decapod" completed for the Dom Pedro II R. R. of Brazil, the first "mikado", exported to Japan and the first wagon top boiler built for the Denver & Rio Grande R. R. In 1891 he brought out his first four cylinder compound and these locomotives were widely distributed on our American roads.

Shortly after coming to the Baldwin Works he designed the hydraulic forge for making driving wheel centers. He introduced the double shift at Baldwin's in order to reduce the idle time on machine tools. He suggested the use of the electric motor to machine tools to George Westinghouse.

He was a successful merchandiser. When times were dull, he either looked to foreign fields or else tried to "pep up" the home market.

Roumanians probably will not forget the deal he made with Queen Marie, by which he sold $15,000,000. worth of locomotives and machinery payable in 60 monthly installments either in cash or oil. The oil he sold to the British government at a handsome profit. Nor in this country, will we forget the "Prosperity Special"—a consignment of fifty heavy freight locomotives shipped to the Southern Pacific that cost $5,000,000. that was hauled in a solid train across the country during the depression of 1922.

Mr. Vauclain had many talents and among them was his uncanny ability as a practical engineer who knew steam locomotives and shop practice from top to bottom. Although interested in civic affairs, his chief interests were with the Baldwin Works and the group of industries allied with it. His name has been as closely associated with these works as that of Matthias W. Baldwin, the founder. From all over the country poured messages of profound sorrow and we too, regret the passing of one of our Life Members.

In Memory Of

JOHN W. KNOWLTON

345 North 18th Street

Decatur, Illinois

Who Died on December 22, 1935

and

SAMUEL M. VAUCLAIN

123 South Broad St.

Philadelphia, Pennsylvania

Life Member

Who Died on Feb. 4, 1940